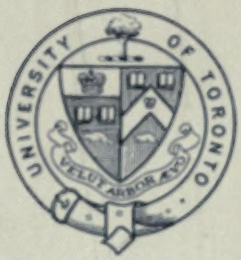

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IN MEMORIAM.

Alonzo F. Lea, a deputy of the Fish and Game Commission for many years, died in Santa Rosa on October 26, 1916. A week previous he fell from a step-ladder while repairing an awning at his home in Cloverdale and fractured his skull. At the time it was realized that he was dangerously hurt and as soon as possible he was taken to the hospital at Santa Rosa, where the best of medical skill was available. During the few days that he lingered, he never fully regained consciousness, and died without recognizing those closest to him.

Lea's work for game conservation began during the nineties. In the early days he was detailed to various parts of the state, but his best work was accomplished in Sonoma, Lake and Mendocino counties. His familiarity with the roads and trails, his fearlessness, his extensive acquaintance in all parts of these counties made him a particularly valuable man. The fact that the counties in which he worked are well supplied with game today is largely due to his conscientious work.

He was buried at Kelseyville, Lake County. Notwithstanding the comparative inaccessibility of this town, hundreds of friends came from distant places and many of the public officials of Lake County were present at the funeral. He was borne to his last earthly resting place by associates in the employ of the Fish and Game Commission.

It is difficult to express in words the sentiment that fills us at the burial of a loved and respected friend. The tribute paid him at the grave by his former chief, Charles A. Vogelsang, was fitting and most appropriate. It was as follows:

"We, his former associates and comrades, have come here today to pay our last tribute of respect and affection for one who was our friend, a true soldier in the ranks. His work was characterized by courage, loyalty and integrity. He rendered a great service to the nation and the state. In the performance of his difficult duty he made no enemies, only new friends.

"Of him it can be truly said, 'his life was gentle and the elements so mixed in him that nature might stand up and say to all the world, he was a man.'"

—J. S. H.

—*From drawing by Charles Bradford Hudson*

EASTERN BROOK TROUT *(Salvelinus fontinalis)*

CALIFORNIA FISH AND GAME

"CONSERVATION OF WILD LIFE THROUGH EDUCATION"

Volume 3 SAN FRANCISCO, JANUARY 20, 1917 Number 1

HISTORY OF THE INTRODUCTION OF FOOD AND GAME FISHES INTO THE WATERS OF CALIFORNIA.*

By W. H. SHEBLEY, In charge Fish Culture, California Fish and Game Commission.

The California Fish Commission during the first decade of its existence introduced into the waters of this state a number of varieties of food and game fishes and the attending results are regarded as being among the greatest achievements in fish-culture and acclimatization. The only work of the kind that will bear favorable comparison is the introduction of food and game fishes into New Zealand. The success of the work was due largely to the untiring efforts of Dr. Livingston Stone, a fish-culturist of that day, in the employ of the New York Fish Commission; and to the study and the practical work of Mr. J. G. Woodbury, who later became Superintendent of Hatcheries for the California Fish Commission.

The most important work in the introduction of new fishes into the state was accomplished during the period from 1870 to 1883; following this came the preservation of the fishes, and the artificial propagation of the native species on a large scale, to multiply their numbers to meet the demands of commerce and of an increasing population.

Since its initial organization in 1870, the Fish and Game Commission has introduced into the waters of California about thirty new varieties of fish, with varying degrees of success. Following is an account of the species introduced, the dates of introduction, and the results obtained:

1. In 1871, the State Fish Commission secured the services of Mr. Seth Green, the noted fish-culturist, to superintend the transportation of a consignment of shad fry across the continent from New York to California. Mr. Green and an assistant left Albany, New York, on June 19, 1871, with 12,000 young shad fry (*Clupea sapidissima*) and arrived at Sacramento on June 26th. The same day the fish were planted in the Sacramento River, at Tehama. About 10,000 of the fry were in good condition at the time the plant was made. Early in June, 1873, a second shipment of shad was made by Dr. Livingston Stone. The trip across the continent was a joint affair planned by the

[*No state in the Union has been more successful than California in establishing new food and game fishes, but there are comparatively few of our citizens who know the names or the history of the many introductions. It is fortunate that sufficient records have been kept to make possible this outline of the different attempts to introduce desirable species. The present article is an extract from one which appeared in the "California Blue Book" for 1911, pages 513–527. Although some of the scientific names used are obsolete, yet the name used at the time of introduction has been retained without change.—EDITOR.]

federal and the California commissions, and for the first time a car was used especially equipped for the work of transporting the fish. This aquarium car was the property of the United States Fish Commission; it was fitted with tanks for sea and fresh water, ice chests, apparatus for aerating the water, supplies for the attendants, sleeping accommodations, etc. The car carried nearly 300,000 valuable food and game fishes, consisting of ten species. Unfortunately, owing to the collapse of a railroad bridge over the Elkhorn River, in Nebraska, the car was destroyed and the whole consignment was lost. However, this accident did not deter the California Commission from carrying out its purpose of getting a second lot of shad into California. Dr. Stone was instructed to return East and secure another shipment. Accordingly, on the 25th of June, he left Castleton hatchery, in New York, with a third shipment of shad fry and July 2, 1873, 35,000 were planted in the Sacramento River, near Tehama. The expense of this shipment was paid by the United States Commission. Several other shipments were made by the United States Commission between 1876 and 1880. All the shad fry, totaling 619,000, were planted in the Sacramento River, near Tehama. In 1873, two years after the first shad were deposited in the Sacramento River, several mature specimens were taken in San Francisco Bay. The species has continued to increase until it is now one of the most common fish in our waters.

2. The German carp (*Cyprinus carpio*) was first imported into California in 1872, by Mr. J. A. Poppe of Sonoma County. He brought five fish from Holstein, Germany, and put them into his private ponds, where he held them and did a thriving business for a number of years, selling their progeny for purposes of propagation. In 1877, the California Commission exchanged trout eggs with the Japanese Government for 88 young carp, and in 1879, the Federal Commission shipped 298 carp to California; 60 of these were planted in Sutterville Lake, near Sacramento, the remainder in a private pond in Alameda County, where they were at the disposal of the State Commission. During the same year, J. V. Shebley, a fish-culturist and private pond owner in Nevada County, began the propagation of carp; and in 1883, he sold to the California Commission 600 German carp, which were deposited in the Sacramento River, near the city of Sacramento. In 1882, the United States Commission began to deliver carp to private applicants; and in a short time carp were to be found in nearly all public and private waters of the state, in which they would thrive. At the time these plants were made the carp was one of the most popular of fishes; they were recommended as being valuable food fish that would thrive in all of the warmer lakes, ponds, and streams of California. Much has been said for and a great deal more against the introduction of carp into California; but while they probably have been the principal cause of destruction of the California perch, by eating the eggs and digging up the nests, at the same time they furnish the chief food of the black and the striped bass, two varieties of fish whose value more than offsets the damage done by the carp. In time, as other species become more scarce, the carp will probably become one of the state's most valuable food fishes, as it already is in older states and countries.

3. The eastern brook or speckled trout (*Salvelinus fontinalis*) was first introduced into California in 1872. The state purchased 6,000

fish and distributed them equally in the North Fork of the American River, the headwaters of Alameda Creek, and in the San Andreas Reservoir, near San Francisco. The first shipment of eggs (60,000) that produced results was purchased by the California Commission in New Hampshire, in 1875, and hatched at Berkeley. The fry from this lot were distributed principally in lakes and streams in Mendocino, Sonoma, Napa, Yolo, Alameda, and Santa Clara counties, and in Prosser Creek, Nevada County, and the North Fork of the American River, in Placer County. In 1877, 1878, and 1879, eggs were obtained from New Hampshire and Wisconsin, and the resulting fry were distributed over a large area of the state's waters, the North Fork of the American River and the Truckee River receiving the largest plants. The fish planted in the coast streams did not reproduce, but those planted in Siskiyou, Placer, and Nevada counties, and in the high Sierra lakes and streams multiplied remarkably well. In 1890, the work of propagating the eastern brook trout was taken up in earnest and each year the Commission distributes thousands of these trout in nearly every county having suitable waters; they are now one of our most sought after fish.

4. Between 1872 and 1883 the national commission furnished the state commission with six consignments of whitefish (*Coregonus clupeiformis*), aggregating nearly 1,500,000 eggs. The eggs were hatched at Berkeley, at San Leandro, and in a temporary structure erected on Clear Lake, in Lake County, and the fry were distributed in some of the larger lakes and streams of the state that seemed best adapted to the habits of the fish; but they did not thrive. The western or Rocky Mountain whitefish (*Coregonus williamsoni*) found in the Tahoe basin has been often mistaken for the imported species.

5. In 1874, at the request of the California Commission, a second attempt was successfully carried out to bring the common eel (*Anguilla chrisypa*) to California, the first attempt having ended with the disaster to the aquarium car. Of the original shipment, consisting of several thousand small individuals, the loss in transit of the fresh water eel taken from the Hudson River, New York, was almost complete; but twelve survived, and these were placed in a slough of the Sacramento River, near Sacramento; but the salt water eels from New York Harbor stood the journey better, and about 1,500 were deposited in San Francisco Bay, near Oakland. In 1879, Dr. Stone brought out a second shipment of about 500 small eels; these were planted in the Sacramento River. In 1882, Mr. J. G. Woodbury of the California commission transported ten adult eels from the Shrewsbury River, New Jersey, and deposited them in Suisun Bay. There have been no apparent results from any of these plants.

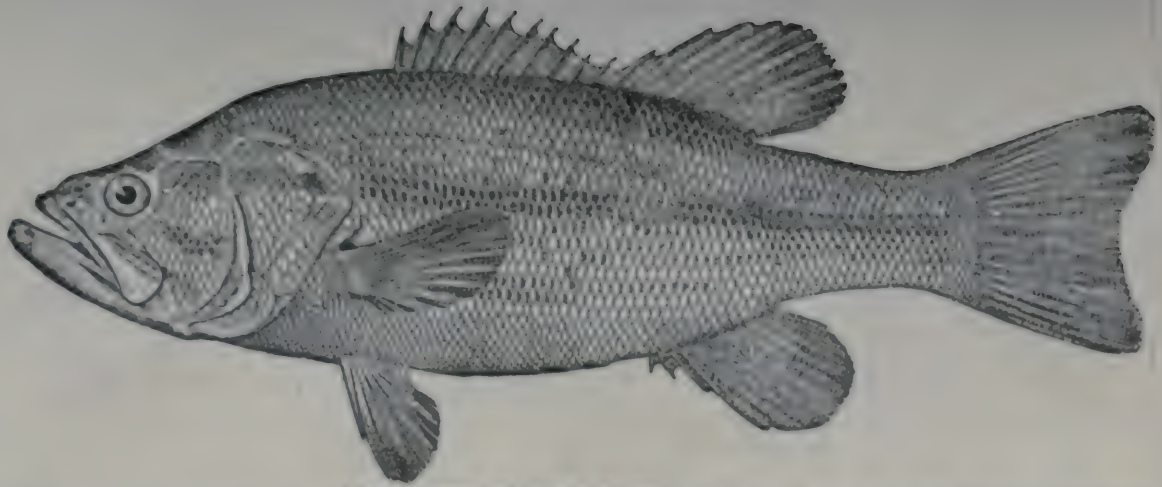
6. The American or eastern lobster (*Homarus americanus*) was first introduced into California waters in 1874, a consignment made the previous year having been lost when the aquarium car was destroyed. Under the auspices of the California commission, Dr. Stone started with 150 full-grown, egg-bearing females from Massachusetts Bay; but four of them reached the coast alive, and these were planted in San Francisco Bay, near Oakland. Subsequently four other small shipments were made, the last in 1888. Plants were made in San Francisco Bay, off Bonito lighthouse, off Point Lobos, to the south of

Carmel Bay, and in Monterey Bay; but although several of those planted in Monterey Bay have been taken by fishermen, no resulting increase in numbers has attended any of the plants made. Thus far the reason for the failure of the lobster to multiply in these waters is not definitely known, as the physical and biological character of the waters of the Pacific Ocean is apparently suitable for its acclimatization.

7. In 1874, several species of catfish were introduced—the common bullhead or horned pout (*Ameiurus nebulosus*), the channel or spotted cat (*Ictalurus punctatus*), the white or Schuylkill cat (*Ameiurus catus*), and one or more species from the Mississippi Valley. On June 12th, fifty-four large Schuylkill catfish from the Raritan River, New Jersey, and the Mississippi catfish, were planted in the San Joaquin River, near Stockton; while seventy bullheads from Lake Champlain, Vermont, were deposited in ponds or sloughs near Sacramento. The Schuylkill cat of the Sacramento River increased very rapidly and soon was as commonly seen in the markets as our native fish.

8. An attempt was made to acclimatize the Atlantic salmon (*Salmo salar*) in 1874, when 305 of the 450 fish brought by Dr. Stone from the Penobscot River, Maine, were planted in the Sacramento River, near Redding. No results were obtained from this plant, as the number of fish planted was not great enough to determine whether they would or would not become acclimated to the waters of the Sacramento. The United States Commission hatched out 200,000 eggs at Fort Gaston, California, in 1890, and in May, 1891, 194,000 fish were liberated in Trinity River; but no run was established.

9. The black basses, both species (*Micropterus salmoides*) the large-mouth and (*Micropterus dolomieu*) the small mouth, have been introduced into California, and have thrived remarkably well. The first shipment, brought out by Dr. Stone in 1874, consisted of seventy-five full-grown spawning bass from Lake Champlain, Vermont, and twenty-four small fish from Saint Joseph River, Michigan, both shipments being of the small-mouth variety; the former were planted in Napa Creek, the latter (twelve survivors), in Alameda Creek. A second shipment of twenty-two mature fish was brought out by Dr. Stone in 1879, and planted in Crystal Springs Reservoir, in San Mateo County, where they increased rapidly; hundreds of the progeny were consigned to various waters in the state. The United States Commission, in 1891, deposited nearly 2,000 yearling large-mouth bass in Lake Cuyamaca, in San Diego County, and 620 in the Feather River, near Gridley. In June, 1895, at the request of the California Fish Commission, the United States Commission delivered 2,500 large-mouth bass fry to the agents of the state commission. These fry were placed in the ponds at the Sisson hatchery, where they thrived, and whence the species was distributed throughout the state, wherever suitable waters were to be found. In the same month, fifty fish were put in each of the following California waters: Buena Vista Lake, near Bakersfield; reservoir near San Diego; and Elsinore Lake, near Elsinore. Agents of the Fish Commission distribute a large number of bass each season from the overflowed districts, where they are seined and deposited in public waters. Both species of the bass are highly esteemed as food and game fishes, and are a great acquisition to the fish life of California.



LARGE-MOUTH BLACK BASS—*Micropterus salmoides*.

Fig. 1. Large-mouthed black bass, first introduced into the waters of California in 1891, when 2,000 yearlings were placed in Lake Cuyamaca, in San Diego County, and 620 in the Feather River near Gridley, Butte County. In 1895 another shipment was received from the United States Fish Commission and placed in ponds at the Sisson Hatchery, from which place they were distributed to all parts of the state.

10. A shipment of eighteen full-grown wall-eyed or glass-eyed pike, or pike perch (*Stizostedion vitreum*) was brought to California in 1874 from the Missisquoi River, Vermont, and sixteen were planted in the Sacramento River, near Sacramento City; but they did not multiply.

11. The tautog (*Tautóga onitis*) was first brought to California by Dr. Livingston Stone in 1874, and a second lot in 1897. Both shipments were deposited in San Francisco Bay; but they consisted of only a few hundred fish each and no results were obtained.

12. Four full-grown rock bass (*Ambloplites rupestris*) of the six obtained from the Missisquoi River, Vermont, were brought to California by Dr. Livingston Stone, in 1874, and deposited in Napa Creek, a tributary of San Pablo Bay, on June 12th. No known results have attended the planting of this fish.

13. In 1877, the California commission exchanged salmon and trout eggs with the Hawaiian Government for a shipment of 100 fish, known as the awa (*Chanos cyprinella*); they were planted in a small stream at Bridgeport, in Solano County. There is no record of any of this species having survived.

14. The eggs of the landlocked salmon (*Salmo salar sebago*) were first brought to California in 1878. Between that date and 1895 at least five shipments were received from the federal commission, totaling about 135,000 eggs. These were hatched at the San Leandro and the Shebley hatcheries, and the fry distributed in the cold lakes of the high Sierras, and in the lakes and streams of the Truckee Basin. A few fish have been taken that had reached maturity, but the species has not increased in numbers. The fish have been held in the hatchery ponds at Sisson for a time and have thrived, but no particular effort has been made to propagate them. A shipment of the eggs was hatched at Sisson hatchery and another lot at Bear Valley hatchery, in the early nineties.

15. One of the most important and successful importations of fish into California waters was made when the striped bass (*Roccus lineatus*) was introduced in 1879. The introduction of this valuable food fish was first suggested by S. R. Throckmorton, president of the California Fish Commission, in a letter to Professor Spencer F. Baird, then United States Commissioner of Fisheries. As a result of this suggestion, Dr. Livingston Stone was instructed to transport a shipment of striped bass to California. Accordingly, he collected from the Navesink River, in New Jersey, 132 fish, ranging from one and one-half to five inches in length, and thirty medium-sized fish. Twenty-five of these died en route, but the remainder, about 135, were deposited in the Straits of Carquinez, at Martinez. Individuals from the first lot were caught in the lower waters of the bay within a year from the time that they were planted, and a number were caught occasionally for several years afterward; but the commission decided to have a second shipment made from the East, as it was not certain that the fish were increasing. Accordingly, in June, 1882, Mr. J. G. Woodbury was sent East by the California Fish Commission to procure another shipment. He collected 450 fish five to nine inches long from the Shrewsbury River, New Jersey, and in the latter part of July arrived with a little over 300 of the fish in good condition; they were planted in Suisun Bay, at Army Point,

near Suisun. Considering the small number of fish introduced and their remarkable increase in a few years, the result obtained from the introduction of the striped bass into California is one of the greatest feats of acclimatization of new species of fish in the history of fish-culture. In 1889, hundreds of them, weighing from one-half to a pound each, were being caught and sold in the San Francisco markets. From 1889 to 1892, the number caught had increased 250 per cent; such quantities were being taken in 1889, it was feared the fish would be exterminated before they had come to maturity and had a chance to reproduce; so the Supervisors of San Francisco County, at the request of the Board of Fish Commissioners, passed an ordinance prohibiting the sale of striped bass under eight pounds in weight. A state law was afterward passed making it unlawful to take bass under one pound; and later this was changed to the present limit of three pounds. It is now also unlawful to ship striped bass from the state. The striped bass is one of the finest food and game fishes in the United States; and if the California Fish Commission had not succeeded in acclimatizing any other variety of fish, the value of the striped bass alone would more than repay the people for all the money expended in introducing other species. Over two million pounds of striped bass have been marketed in one season in San Francisco. This does not include the amounts sold in other places.

16. In 1891, 3,000 yearling yellow or ringed perch (*Perca flavescens*) were deposited by the United States Commission in the Feather River, and 3,980 in Lake Cuyamaca, in San Diego County, where they increased rapidly. A few were taken to Sisson hatchery and placed in the rearing ponds, in 1895. They remained healthy and made a good growth, but owing to lack of pond room no efforts were made to propagate them to any extent. Occasionally a few have been taken from the Feather River and from some of the sloughs in that region, but as the species has not been generally distributed, the results of the planting have not been fully determined.

17. Four hundred yearling warmouth bass (*Chaenobryttus gulosus*) from Quincy, Illinois, were planted by the United States Commission in Lake Cuyamaca, near San Diego, in 1891. In the same year, 100 yearlings were deposited in Feather River, near Gridley, Butte County; and in 1895, twelve fish were delivered at Sisson hatchery, but they were not in good condition. Six of them died shortly after they were placed in the ponds; the remaining six survived until the following spring, but food conditions not being suitable, they did not thrive and died before spawning.

18. The crappie (*Pomaxis annularis*) and the strawberry or calico bass (*Pomaxis sparoides*) were introduced in the early nineties, but were not widely distributed. In 1891, 285 yearlings were deposited in Lake Cuyamaca, near San Diego, and in 1895, 50,000 fry were sent to the Sisson hatchery; but none of them lived.

19. In 1891, a shipment of 400 yearling pike (*Lucius lucius*) was made to Lake Cuyamaca, near San Diego, and another 100 were placed in the Feather River, in Butte County. The fish planted in Lake Cuyamaca increased for a time, but those in the Feather River have not multiplied. In 1895, six pike were delivered at Sisson hatchery; they thrived in the ponds for a year, when they were placed in an aquarium

at the Mechanics Fair, in San Francisco, and died before the fair was over. It is well that they died and that those planted in the Feather River did not survive; for the species is too predatory to plant among our valuable fishes.

20. In May, 1893, the New York commission gave 100,000 muskellunge fry (*Lucius masquinongy*) from Chautauqua Lake to the California Fish Commission. The United States Bureau of Fisheries transported the fish free of charge as far as Ogden, from which place the consignment was under the auspices of the California commission, the Spring Valley Water Company paying half the cost of transportation from Ogden to San Francisco. The fish were received in good condition, and 93,000 were placed in Lake Merced, near San Francisco, to destroy the carp in the lake, as they were keeping it roily and made the water almost unfit for use, but they did not survive; and as in the case of the pike, it is probably as well that they did not, for while they are a game fish, they are too predaceous to place among our more valuable fishes. These fish were put in private waters with the understanding that the commission might take such fish for distribution or breeding purposes as might be desirable.

21. The lake trout (*Salvelinus namaycush*), known also as the salmon or Mackinaw trout, was first brought to California in 1894. The shipment of 100,000 eggs was hatched at the Sisson hatchery, with a loss of only 7 per cent. Sixty-five thousand of the fry were planted in Lake Tahoe in May, 1865, the remainder being held in the ponds at the Sisson station and shipped the following season. Several other lots were hatched at Sisson, and the fry deposited in the lakes of the Truckee Basin. A number of these fish are taken each season from the waters that have been stocked, where they have thrived to a considerable extent, but not as well as was expected. This trout is abundant in the waters of lakes Superior, Huron, and Michigan, and should attain a large size in Lake Tahoe, as the species is adapted to cold, clear, deep lakes.

22. In February, 1894, 20,000 eggs of the Loch Leven or Scotch lake trout (*Salmo trutta levenensis*) were sent to the California commission from the stock ponds of the United States Government at Northville, Michigan. They were hatched at Sisson hatchery, and the fry deposited in the hatchery ponds, where they thrived. The stock has been retained in the Sisson hatchery ponds ever since, where they have been propagated successfully, and thousands of the fry are shipped each year for distribution in the public waters of the state.

Fig. 2. Loch Leven trout. The original stock of Loch Leven trout was received in 1894, when 20,000 eggs were received from the United States Fish Commission Hatchery at Northville, Michigan. Thousands of Loch Leven trout fry are now shipped out from the Sisson Hatchery each year.

The Loch Leven and the German brown trout are closely allied and appear to be but different varieties of the same species. They are somewhat different in their habits, but do equally well in the clear, cold lakes and streams of the Sierras, as well as in the region around Mount Shasta. The two varieties have been crossed at the Sisson hatchery, and have produced a strong, gamy fish.

23. In 1895, 135,000 Von Behr or German brown trout eggs (*Salmo fario*) were hatched at the Sisson hatchery. Several thousand fry were placed in the ponds to be raised for breeders, and the remainder were distributed in a number of the lakes and streams of the high Sierras. Previous to this the federal government had made several plants in the state.

24. Twelve yearling white bass (*Roccus chrysops*) were received at Sisson hatchery from Quincy, Illinois, in June, 1895. They were not in good condition and seven of them died shortly after their arrival; the others died the following fall. This introductory shipment of white bass is the only one of which there is any record.

25. Small plants of the green sunfish (*Lepomis cyanellus*) and the bluegill or blue bream have been made in California. In 1895, twelve yearlings were delivered to the Sisson hatchery; eighteen were put in Elsinore Lake, and eighteen in the Bolsa Chico River. A few were accidentally introduced with other fish into Lake Cuyamaca, near San Diego, in 1891. Wherever conditions are favorable, these fish have thrived.

26. The California Fish Commission has endeavored to introduce the Montana grayling (*Thymallus montanus*) into the waters of California, but so far without any known results. The eggs are very delicate and the fry hard to raise. In 1904, 100,000 eggs, from Bozeman, Montana, were received at the Sisson hatchery in good condition. Seven thousand of the fry were placed in a pond that was thought suitable for them; they thrived for eighteen months, then became diseased and died off, until only 600 were left; these were placed in a pond where they were in an entirely wild state and could subsist on natural food. These fish and a few that were saved from a lot received the following year grew up together and promised to furnish some eggs for propagation, but owing to the accidental bursting of the pond wall, the fish escaped into one of the tributaries of the Sacramento River, just as they were reaching maturity. Several thousand of the fry were distributed from the second lot of eggs that were received, into waters that, from descriptions given of the fishes' habits, appeared to be ideal, but no results have been noted thus far. The grayling is considered by some anglers to be the most beautiful and graceful of American fresh-water fishes. They rise to the artificial fly more quietly than do the trout, but make a good fight and are an excellent table fish.

The last lot of fresh-water fishes received in California from the United States Bureau of Fisheries was in November, 1908. The fish were shipped from Meredosia, Illinois, and consisted of crappie (*Pomoxis annularis*), blue-gilled sunfish or bream (*Lepomis palladus*), and yellow perch (*Perca flavescens*). They were distributed as follows:

Four cans of crappie and sunfish in Honey Lake, Lassen County; a number of yellow perch and crappies in Vera Lake, Nevada County;

sunfish and yellow perch in lakes in Placer County, and in sloughs of the Feather and Sacramento rivers; some of all three varieties near Stockton, and in Clear Lake, Lake County; perch and sunfish in Kings River and San Joaquin River, and sunfish and yellow perch in Kern River and Buena Vista Lake. Some of the fish were planted in Russell's Lake, Ventura County, and in suitable waters in Los Angeles, Riverside, and Orange counties. Reports from several of these places have been received and indicate that the fish are thriving and increasing.

No effort has ever been made by the commission to introduce eastern oysters, but it is stated that they were first brought into California in or about 1870, by Mr. A. Booth of Chicago, and it is recorded that the first shipment, consisting of three carloads of large oysters, so overstocked the market that in order to avoid loss the consignee had to plant in San Francisco Bay all the stock not promptly disposed of. The enforced planting resulted favorably, and it became the custom to annually ship one-year and two-year seeds to be planted on the grounds in the southern part of San Francisco Bay, where they remained for two and three years, or until they attained a suitable size for marketing. There have been various reports of wild eastern oysters taken at different points in the bay, and Mr. Chas. H. Townsend, in the Report of the United States Fish Commission for 1889-91, says: "It is possible that during the long time eastern oysters have been kept in the bay they have become in a measure acclimated, and that there is a constantly increasing tendency to propagate—that is, the progeny of oysters grown here become hardier with each generation and better adapted to the colder but more equable waters." Full accounts of the early eastern oyster industry in San Francisco Bay are given in Mr. Townsend's article and in an article by Captain J. W. Collins, in the Report of the United States Fish Commission for 1888.

From 1899 to 1908 the oyster industry decreased gradually, all of the oysters taken in the latter year being taken from private beds, and used for market purposes only. All seed oysters planted that year were shipped from eastern beds.

The appearance of the soft-shell clam in San Francisco Bay was first noted in 1874. The spawn is supposed to have been accidentally introduced with the carloads of eastern oysters planted in the vicinity of San Francisco. They soon covered the mud flats surrounding San Francisco Bay, and were taken in great numbers.

THE FISH DISTRIBUTION OF 1916.

By G. H. Lamson, Superintendent Sisson Hatchery.

When the last carload of trout left the hatchery we gave a sigh of relief to think that the arduous work of the past four months had been brought to a successful conclusion, and that so many fine trout had been planted in the public waters of the state, where all could enjoy the pleasure and profit of catching them. There were the gamy steelhead, the beautiful eastern brook trout, the black-spotted trout from the cold waters of Tahoe, the Loch Leven trout whose ancestors came from Scotland, and last but best our own native favorite—the rainbow. They were fine, lusty fellows, and all were sent forth to the waters best suited to each kind, to add to the health and pleasure of our people.

Our thoughts turned to the many anglers who, by purchasing licenses, supported the hatcheries and made the great work possible. But they have their reward, for any one who catches but two pounds of trout during the season is repaid in a medium as valuable as gold, while he who catches as much as twenty pounds receives a thousand-fold return. But there is a greater value, more subtile, but none the less real, that of the health and pleasure of the people. On any summer night along a hundred streams and lakes may be seen gleaming the campfires of the happy anglers, camping out and breathing the health-laden air of wood and stream. The worried business man, the weary laborer, the professional man, all are there, often, with their entire families, and all reaping a greater profit than could be had from any other investment, for health and pleasure are the dividends.

Our state is famous for its beautiful women and keen, alert men of business, and if the cause could be sifted into its component parts I wonder how much would be found to be due to our well-stocked streams? Surely it would be very large.

The favorite prescription of the physician is to "take a rest, go out into the country and live next to nature," and, I would add, come back with renewed vigor for the strenuous life of today. But the physician's advice is disregarded unless there is some incentive to urge them on, and this is supplied by the fine fishing in our streams and lakes which are stocked annually from the hatcheries.

The commercial side has also received close attention and millions of salmon have been planted in the Sacramento and Klamath rivers. They were not the small fish of the earlier season, but fine, big, well fed yearlings from three to six inches long, fish that are fully able to cope with the dangers that beset them on their journey to the sea, and which will return in from three to six years as mature salmon and add to the wealth of the state, to the delight of the angler, and to furnish a delicious food to those who must, perforce, procure their fish from the market. In our twenty years' experience in salmon work we have never seen planted such large and healthy fish as those distributed this season.

In the distribution from the Sisson hatchery there were forty-three carloads of the various kinds of trout, each averaging 100 cans, and

many thousands were sent out by messengers. There were fifteen carloads of salmon planted in the Klamath River, while the Sacramento was stocked direct from the hatchery by wagon. We can not conceive of a better investment, or one that benefits a greater number of people than the hatcheries. Every class and family, the angler, the commercial fisherman, the dealer or packer, all share in the dividends which are declared daily. Truly our state is a favored one.

SCIENTIFIC NATURE STUDY IN THE PUBLIC SCHOOLS.

By George V. Miller.

We are apt to think of the law of supply and demand as an important and everlasting plan which no amount of neglect will spoil. It is not usually until the loss caused by waste or mismanagement directly affects us that we begin to consider a way to prevent a crisis.

Forests, for example, a few years ago were found to be deteriorating so fast that the government and different states took up the matter of their conservation with added seriousness of purpose. Courses of forestry were established in the various colleges, and conditions partook of a new aspect.

That was the medieval step in forest conservation through education. The modernist perceives cooperation through enlightenment of the people at large—not of the few whom the university courses directly reach. "Teach the children of the public schools the common names and uses of the trees," said Professor Tower of the Department of Forestry, University of Maine. "This will create in them a desire for further knowledge of the subject, and give them, not too late, a reason for the folly of waste."

Don Carlos Ellis, in charge of educational work for the United States Forest Service, made an everlasting impression upon the school children of San Francisco who were so fortunate as to hear his lectures and see their accompanying motion pictures, during the recent exposition. The United States Forest Service is placing emphasis on the educational method of forest conservation.

A campaign is on for the conservation of wild life through education. The courses are so well conducted and attended, and the names of those in charge so familiar, that I need not dwell upon this phase of the work. Be it sufficient to say, however, of wild life as a study, that its really systematic introduction occurs, generally speaking, in the university. Nearly all the work in the grades is merely incidental. A hint to us that the children will be sought in case of a doubtful situation, is the recent urgent appeal to them to save all newspapers against a possible paper famine. Then give the children something substantial in nature study. Beside its scientific and economic lessons

the work has its moral and artistic values, the habit of killing being reduced to a minimum when students have learned to thoroughly enjoy animals and birds alive through knowing them. The study will prove pleasurable to them and profitable to everyone.

A country or suburban teacher has not far to look for available material. I found the boys knew the local birds, and were desirous of studying their habits more closely. Next came birds of exceptional interest from other regions, for nature study should no more be confined to one small corner of the world than is geography.

It was not until last year that I ventured to introduce bird study in a city school. Leo Wiley, collector of specimens, had sent me a number of bird skins as an aid. Several lessons had been given after my usual method of procedure, when I promised to show the class on the following day the skin of a California roadrunner.

Unusual excitement followed this announcement. The majority of the boys thought it a new kind of automobile. How could I show the skin of a machine? But the girls were sure it was a snake, and shivered becomingly. Not one had ever seen a roadrunner. They examined the stiff eyelashes, speculated upon what the bird must eat, marveled at the length of his legs, now fully understanding why the Spanish called him "*correo del camino,*" which our Anglo-Saxon pioneers later translated to roadrunner.

Each of the specimens was shown many times, not only to the members of my own class, but to others. The boys had spread the news, and so extravagantly that many believed my supply equal to a museum's. I was gratified, even though enthusiasm had got the better of veracity in several instances. I felt like the Pied Piper, only that in our case a way to new observations had been opened to the children without the closing of a mountain, behind which lay the joys of childhood.

That those boys will look and listen when afforded an opportunity I have no doubt. During vacation a newsboy whose name was unknown to me, tucked a copy of the "Bulletin" under my arm. He smiled sweetly, and I was about to pay him when he shook his head and rushed after a prospective customer. On his way I heard him reply to a companion, "No, not mine—the big guys' teacher; the one that knows everything about birds."

So many teachers have expressed the desire for something definite as an aid to the introduction and presentation of the subject of birds, that I submit the following outline. This I have used successfully, in more or less the same form, a number of years. There are innumerable

reference books, among them Mrs. Bailey's "Handbook of Birds of the Western United States," than which none is more complete at the present time.

DETAILED OUTLINE FOR THE STUDY OF ANY BIRD.

I. Location.
1. State or portion of state.
2. Woods or open.
3. Swampy or dry section.

II. Description.
1. Size.
(1) Compared with robin.
(2) Compared with English sparrow.
2. Shape.
(1) Body.
a. Long and slender.
b. Short and stocky.
(2) Head.
a. High or crested.
b. Small and round forehead.
(a) with body.
(3) Bill.
a. Large and strong.
b. Short and stocky.
(4) Tail.
a. Long.
b. Short.
c. Notched.
d. Forked.
e. Rounded.
(5) Wings.
a. Long.
b. Short.
(6) Feet.
a. Large and strong.
b. Small and weak.
3. Color.
(1) Upper parts.
(2) Lower parts.
(3) Special markings.
a. Chin.
b. Eye.
c. Rump.
d. Tip of tail.
e. Under tail parts.
f. Outer tail feathers.
g. Wings or wing bars.
h. Belly.
i. Breast.
4. Movements.
(1) On the ground.
(2) In flight.
(3) On perch.

III. Family.
1. Sparrow finch.
2. Swallow.
3. Flycatcher.
4. Goatsucker, swift, hummingbird.
5. Lark.
6. Warbler.
7. Thrush.
8. Waxwing.
9. Tanager.
10. Wren, thrasher.
11. Vireo.
12. Kinglet.
13. Oriole, blackbird.
14. Crow, jay, magpie.
15. Kingfisher.
16. Nuthatch.
17. Woodpecker.
18. Shrike.
19. Owl.
20. Hawk, eagle.
21. Vulture.
22. Grouse, partridge, quail.
23. Snipe.
24. Plover.
25. Roadrunner.

IV. Food.
1. Vegetable.
2. Animal.
3. Manner of obtaining—
(1) While in flight.
(2) Flying from perch.
(3) From trees or bushes in trees.
(4) From the ground.

V. Song or call.

VI. Residence.
1. Summer.
2. Winter.
3. Permanent.
4. Transient.

VII. Migration.
1. Time.
2. Place.

VIII. Nesting.
1. Time.
2. Place.
3. Kind of nest.
4. Eggs.
(1) Number.
(2) Color.
(3) Size.
5. Young birds.

CALIFORNIA FISH AND GAME

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All material for publication should be sent to H. C. Bryant, Museum of Vertebrate Zoology, Berkeley, Cal.

January 20, 1917.

"The United States is not yet ours in the proudest sense, and can not be until we are doing all that can be done to give to all its people and to the world the full expression of its highest intelligence applied alike to its resources and to the life of the people." —Franklin K. Lane.

WILL YOU DO YOUR SHARE?

Please read again the above quotation by Franklin K. Lane, Secretary of the Interior, and emphasize the words "full expression" and "resources." What is California's "full expression of its highest intelligence applied to its fish and game resources?" Is it the still noticeable disregard for protective laws? The noticeable waste of a valuable food supply? The neglect of valuable species reduced to the danger point? The tolerance of the game hog? No! The full expression of California's highest intelligence is more than this. With the convening of the legislature this month there is opened another chance to better game conditions and conserve for the future the wild life resources of the state. The goal suggested above can only be reached when all the people of the state take an interest in fish and game and do their share toward its realization. See that your representatives believe in "conservation" and back up their belief with action. Do your share!

WHAT DO YOU WISH TO KNOW ABOUT FISH AND GAME?

The Bureau of Education, Publicity and Research of the California Fish and Game Commission should be made a clearing house for information on fish and game. Are you not anxious to know the truth regarding the life and habits of some game species? The number of false stories which are current is appalling. Settle your disputes by writing the bureau. If we are unable to answer your question we will refer it to someone who can answer it. The reply will be sent you by mail or will appear in the columns of CALIFORNIA FISH AND GAME, at your pleasure.

CARL WESTERFELD.

NEW EXECUTIVE OFFICER.

At a called meeting of the State Fish and Game Commission, held at Sacramento on December 8, 1916, Carl Westerfeld, fish and game commissioner since November, 1911, resigned as commissioner and Mr. Edward L. Bosqui of San Francisco was appointed by Governor Johnson to fill the vacancy. The commission then appointed Mr. Westerfeld as executive officer to succeed Ernest Schaeffle, who resigned in September, 1916. All who know Mr. Westerfeld are congratulating the commission on its choice and the whole state on its good fortune in obtaining the services of so capable a man.

Carl Westerfeld was born in San Francisco and has lived in that city all of his life, with the exception of the few years spent at college. He took his A.B. at Yale University in 1893, and in 1896

graduated from Hastings College of Law. He was admitted to the bar and has since made a name for himself in his profession. His interest in fish and game led to his appointment as commissioner, and to his election as president of the Pacific Fisheries Society in 1914. For the past five years Mr. Westerfeld, although having many personal interests, has given a great deal of time and attention to the work of the Fish and Game Commission, and consequently is in close touch with its activities and plans.

THE BIENNIAL REPORT.

Clothed in an attractive colored cover showing a mountain lion in wait for deer, the Twenty-fourth Biennial Report of the Fish and Game Commission is off the press and ready for distribution. The report covers the period from July 1, 1914, to June 30, 1916, and gives in detail the work accomplished by the commission.

The main body of the report, which is a summary of the activities and accomplishments of the commission, is followed by departmental and district reports and by an appendix giving a roster of employees, an inventory of state property, the distribution of fish by counties, the distribution of game birds, and full statistics on lion bounties paid, seizures of fish and game and illegally-used fishing apparatus, violations of fish and game laws, hunters and anglers license sales, and receipts and disbursements. Nearly one hundred halftones illustrate the report. Conspicuous among these illustrations are pictures showing the work of the deputy, a series showing how fish are transported from the hatchery to the stream, seining fish from overflowed districts in the San Joaquin Valley, feeding quail during severe winter weather and various fishways, screens and hatchery buildings.

The report clearly shows that the past biennial period has been one of marked advance in the protection and preservation of wild life, the propagation of fish, the stocking of streams, the construction of fish ladders and screens, and above all, in the accumulation of data on fish and game and the development of a public sentiment favoring wild life conservation. All of the duties of the commission, as above outlined, have been performed as fully and faithfully as the financial and other resources have allowed.

More arrests have been made and more convictions obtained in this than in any previous biennial period.

Educational and publicity work has been largely augmented and one department gives almost its entire time to work of this kind.

The game refuges of the state have been enlarged by the addition of 782,998 acres of national forest lands, which were set aside by the last legislature.

The new and amended fish and game laws of the 1915 legislature have proved to be important conservation measures. Noteworthy in this legislation was the elimination of "bull hunting," the changing of the laws to accord with the Federal Migratory Bird Law and the shortening of seasons and lowering of bag limits.

Large numbers of deer and quail were saved from starvation during the severe winter weather of 1916.

Through the payment of 162 lion bounties in 1915 and of 111 during the first six months of 1916, thousands of deer have been saved from death at the hands of these predators.

Sixty-eight assistants or deputies have carried on active patrol duty, and although some of them patrol areas greater than the state of Vermont, yet wild life has been safeguarded to a remarkable degree.

Sufficient fish were liberated during the year 1915 to furnish every resident of the state with sixteen fish. The hatcheries and egg collecting stations have been operated to their full capacity and the streams of the state are already showing the result.

The department of commercial fisheries, established in 1914, has accumulated important data on the fisheries of the state and has been instrumental in aiding in the development of certain neglected fishery resources.

The attainments recorded in the twenty-fourth Biennial Report indicate that much has been accomplished during the period from July 1, 1914, to June 30, 1916, towards the conservation of fish and game resources in the state of California and that the people of the state may justly be proud of the board which administers these resources. Certainly no other fish and game commission has accomplished more in the same period of time.

HOW LONG?

How long! How long, will the people of the state of California allow officers in state employ to be murdered by aliens, many of whom go unpunished?

Several years ago Bert Blanchard, a deputy of the Fish and Game Commission, was found dead in the hills of Contra Costa County. He had been shot by some hunter, probably an alien. Some years after Ernest Reynaud, another deputy of the commission, was killed by Italian fishermen near Greenbrae. Mr. Reynaud, along with M. S. Clark, had arrested two Italian fishermen. When a third Italian was taken into the boat as interpreter a fight followed, with the result that Mr. Reynaud was killed and Mr. Clark, being thrown out of the boat, only succeeded in saving his life by swimming to shore. Fortunately the man responsible was apprehended and sent to San Quentin for life. Soon after Deputy Frank P. Cady of Susanville was shot in the leg by an Indian violator. In the discharge of his duties Deputy George J. Rodolph was shot by two market hunters near Los Banos. The guilty man was acquitted by a jury and his companion was discharged on a preliminary examination.

As we go to press word comes that Deputies Ray Heacock and Richard Squire were murdered by aliens on Bouldin Island near Terminus, San Joaquin County. Deputy Squire was found in the boat, shot through the head and the boat and his clothing riddled with bullets. The body of Deputy Heacock has not been found at the date of writing. Earlier the same night two white fishermen, at the point of revolvers, were told to move on by four Italian fishermen. The same men later killed these two deputies while they were in the discharge of their duties.

Pennsylvania's answer to outrages of this kind was a law prohibiting the carrying of firearms by aliens. At the time this law was passed it was pointed out that a very large percentage of all the murders in Pennsylvania were committed by aliens. The measure was, therefore, a measure not only to more largely protect fish and game, but to protect human life. Will California take the same steps to stop crimes of this sort?

THE CLOSED SEASON.

The coming few months are especially set aside as a closed season when no hunting whatever is allowed. The most fundamental law of conservation is that animals must be protected during the breeding season. If the parents are killed at this time the young are left to starve. Animals during the breeding season become remarkably tame and the killing of them at this time is not sport but wanton murder. Do your share to protect all wild life on its breeding grounds and see that all your friends and neighbors do likewise.

BOY SCOUT COOPERATION.

Believing that many of our readers will be interested in seeing what boy scouts in this state are doing for the conservation of wild life we are instituting a department in which the scouts will have a chance to demonstrate their work. Only a beginning has been made in this cooperative work and we may expect to see a steady improvement in the output of the boys.

The Fish and Game Commission is endeavoring to do its share by furnishing free stereopticon lectures to the different troops.

HEAVY PENALTY IMPOSED FOR SMUGGLING DUCKS.

A. L. Mason, of Los Banos, was arrested and fined $500 and sentenced to 150 days imprisonment for attempting to smuggle ducks to the San Francisco markets. Mason had 457 ducks in a small machine, and was headed for San Francisco, when by merest chance he was apprehended. He appealed to Night Watchman Michael Collins of Redwood City to help him fix a blow-out, and in the search for a new inner tube the ducks were uncovered. The sentence, imposed by Justice of the Peace George Seely of Redwood City, is the heaviest on record for an offense of this kind.

THE FOOD OF DUCKS IN CALIFORNIA.

If increase of food supply means increased numbers of a game species, it is reasonable to believe that were it possible to furnish artificially additional food for waterfowl, greater numbers would not only be attracted to this state, but many would doubtless remain and breed. The

Fig. 3. Large Loch Leven trout taken in the Owens River by Guy H. Dusenbery of Bishop, Inyo County. Photograph by J. H. Von Blon.

The large Loch Leven trout shown above was taken in the Owens River, about twelve miles north of Bishop, Inyo County, by Mr. Guy H. Dusenbery in November, 1916. A huge hook—probably an Indian's—was found imbedded in its jaw. Probably as a result of this hook the fish was of light weight considering its size. In good condition it would probably have weighed eight pounds. The size of the fish is remarkable in that Loch Leven trout planted by the Fish and Game Commission in the Owens River but seven years ago. The weight of this fish, therefore, indicates a growth of approximately a pound a year.

inroads on the natural food supply made by reclamation can be counterbalanced by artificial planting of those plants furnishing food for waterfowl. More and more interest is being taken in this conservation measure.

To the man or the club seeking information on the proper food plants to grow we recommend the following bulletins:

Three important wild-duck foods, U. S. Dept. Agric. Bur. Biol. Surv., Circ. 81, pp. 1–19.

Five important wild-duck foods, U. S. Dept. Agric. Bull. 58, pp. 1–19.

Eleven important wild-duck foods, U. S. Dept. Agric. Bull. 205, pp. 1–26.

All of these bulletins deal more largely with Eastern conditions, however, and nothing but experiment will demonstrate the value of many of the species for our conditions. In order that more detailed information be available for Californians, the Bureau of Education, Publicity and Research of the Fish and Game Commission has begun an investigation into the food of wild ducks. Hundreds of stomachs have been collected and the contents of these are being analyzed and the results tabulated. Already nearly a hundred stomachs have been examined. When the investigation is completed, evidence as to the seeds, roots and bulbs most often fed upon by the different species of wild ducks will be at hand. It will then be possible to make better recommendations as to the best native food plants to grow in order to attract waterfowl.

STATE FAIR EXHIBIT.

The Fish and Game Commission maintained an extensive and interesting exhibit at the California State Fair, held at Sacramento during the early part of September. Owing to the greatly increased number of exhibitors at this year's fair, the space allotted the commission's exhibit was not as much as desired, but, fortunately, was so located as to be directly in front of the main entrance and in the path of the thousands of visitors, both when entering and leaving the grounds.

A unique octagonal pavilion, forty by forty feet, was constructed of fish nets that had been confiscated from fishermen using them in an illegal manner. An additional lot of confiscated nets, making a pile twelve feet high by twenty feet wide, was shown on the outside of the pavilion.

Large aquaria showing splendid adult specimens of various species of trout, also troughs showing the propagation of trout from the egg to the time when the young fish are liberated, attracted much attention.

All of the species of trout to be found in this state were shown in jars, also some twenty-five species of freshwater fish taken from the San Joaquin and Sacramento delta districts, together with photographs showing deputies of the commission engaged in seining and distributing these fish. Portable pens containing pheasants, quail and deer from the State Game Farm at Hayward, together with mounted specimens of birds and mammals, did much to complete the attractiveness of the exhibit.

There were photographs of the fish hatcheries, the fish distribution car, and a series of splendid pictures showing the work done by the commission in collecting and distributing golden trout to the almost inaccessible lakes and streams of the high Sierras by means of mule pack train. Fish-culturists of the commission were in attendance to explain the artificial method of propagation. The thousands of people who viewed the exhibits went away with a better understanding of the splendid work that is being accomplished by the California Fish and Game Commission.

PRACTICAL EDUCATION.

The Irving School of Riverside, Riverside County, has received the honor of being listed by the New York Audubon Society as one of the ten schools in the United States "standing highest in the contest relating to the identification of local and migratory birds." The fifth grade of the school sent in a list of eighty-one species of birds observed in the near vicinity. Hundreds of schools in the United States entered the contest.

To increase the appreciation of California's many songbirds, the San Diego County Board of Education requested all grades and high schools to give particular study to birds from November 6 to 17, as preparation for a contest based on compositions written on the following

Fig. 4. The Fish and Game Commission exhibit at the State Fair, September, 1916.

subjects: "What I observed in one week," "Bird nests," "Mountain birds," "Our most useful songsters," "Sea birds," and any subject requiring keen observation. The papers were graded on quality and the length of each was left to the discretion of the teachers.

The exposition company offered 100 free admissions for the best 100 papers, and 15 medals for the best 15 papers. Papers were graded by November 14 and the best compositions chosen from every grade and one from every class in the high school. The best products of the art department, showing birds, were exhibited at the exposition, and remained through Bird House Day celebration, held December 15. The commercial departments exhibited designs, the sewing classes exhibited bird embroideries and the music classes sang bird songs.

In our opinion, studies of this kind are of far more value than many of the prescribed courses of study. A child that is "taught to read a roadside as well as to read a book" is worth more to himself and more to the community in which he lives.

THE TREATY WITH CANADA.

Conservationists the country over are rejoicing because of the passage of the Canadian Treaty, which supplements the Federal Migratory Bird Law. The following is a summary of the main provisions:

1. That no bird important to agriculture because of insect-destroying proclivities shall be shot at any time.

2. That no open season on any species of game birds shall extend for a longer period than three and one-half months.

3. That both countries shall so restrict open seasons on game birds as to prevent their being taken during the breeding season.

4. That there shall be no shipment from one country to the other of birds which are taken contrary to law.

atically record arrivals and departures and consequently miss the elation as evidenced in a card recently received from one of our readers.

"Winter Resorts.

"SOCIAL ITEMS.

"Mr. Robin has arrived at the Lastreto Woods, Atherton, and was very busy investigating conditions and making arrangements for Mrs. Robin and his numerous family preparatory to their customary winter sojourn. His rotund form was visible on Tuesday morning, the 7th inst."

Probably few others in the vicinity of Atherton, San Mateo County, even noticed that the western robin had returned for his winter stay. Ignorance regarding bird life in California is great even among

Fig. 5. Deputies of the Fish and Game Commission at work in the marshes of the San Joaquin Valley. From left to right are deputies Smalley, Brownlow, Smith, Maloney, Kimball, Squires, Hoen and Matthews. Photograph by J. E. Newsome.

The treaty is to remain in force for fifteen years and will continue in force beyond that time, provided the contracting powers do not give twelve months notice of a wish to terminate it.

MIGRATION RECORDS.

Many people in Eastern states obtain considerable pleasure by making notes regarding the arrival and departure of birds. Few people in California system-

people of leisure. We trust that as years go by a keener interest will be taken in our bird life and that instead of receiving a single notice of the arrival of a winter visitant, hundreds of cards will furnish data to show the southward progress of the different species from day to day. If any of our readers are looking for a stimulating hobby let them turn their attention to the recording of the arrival and departure of migratory birds.

GOAT ISLAND BECOMES NATIONAL GAME PRESERVE.

The Fish and Game Commission has for several years past liberated pheasants and quail on Goat Island in San Francisco Bay. Both pheasants and quail have been doing well. Due to the efforts of Captain Andrews, formerly commandant of the Naval Training Station situated on the island, who took an active interest in these birds, the island has been declared a federal game preserve.

The executive order, signed by President Woodrow Wilson, is as follows:

It is hereby ordered that Goat Island, containing about one hundred and forty-one acres of land, situated in San Francisco Bay, approximately midway between the cities of San Francisco and Oakland, Cal., shown upon Coast Survey Chart No. 5531, and as segregated by the broken line upon the diagram hereto attached and made a part of this order, is hereby reserved and set apart for the use of the Department of Agriculture as a preserve and breeding ground for native birds, subject, however, to the use of the island for naval, military and lighthouse purposes in conformity to requirements of executive orders heretofore issued.

It is unlawful for any person to hunt, trap, capture, wilfully disturb, or kill any bird of any kind whatever, or take the eggs of such bird within the limits of this reservation, except under such rules and regulations as may be prescribed by the Secretary of Agriculture.

Warning is expressly given to all persons not to commit any of the acts herein enumerated under the penalties of section 84 of the United State Criminal Code, approved March 4, 1909 (35 Stat. 1104).

This reservation to be known as San Francisco Bay reservation.

WOODROW WILSON.

The White House, August 9, 1916.

A TAMALPAIS GAME REFUGE A POSSIBILITY.

Large holdings on the northern watershed of Mount Tamalpais have been purchased by the Marin Municipal Water District. Much of this territory was formerly leased by the Lagunitas Rod and Gun club and game is very plentiful. Fearing that the opening of this area to the public would have the effect of destroying the game and thus taking pleasure from those who will use this territory for outings, a movement is on foot to make of this land a state game refuge, either under the section which allows the creation of reservations on private lands or by legislative enactment. Congressman William Kent, who is backing the scheme, has offered to contribute a sufficient sum to police the refuge.

Fig. 6. Saving fish from overflowed areas in the Yolo Basin. The fish saved from death in this way are planted in other streams of the state. Photograph by McCurry Company, August, 1916.

TURKEY BUZZARD AND DISEASE.

Support for our contention that the turkey buzzard can not be considered a serious menace so far as its disease-carrying proclivities are concerned, as reported in CALIFORNIA FISH AND GAME for October, 1915 (Vol. 1, page 222), has come in a recent bulletin of the United States Biological Survey (Common birds of southeastern United States in relation to agriculture. Farmers Bull. 755). On pages thirty-eight and thirty-nine of this bulletin Mr. W. L. McAtee makes the following defense for the buzzard:

The turkey buzzard now is threatened with persecution in the land where heretofore it has received the most zealous protection, for the bird has been accused of spreading such diseases of live stock as hog cholera and anthrax. The charge that it spreads hog cholera has never been demonstrated, and until this is done

Fig. 7. Kern Buttes at mouth of Volcano Creek, a stream noted as the home of the golden trout. Photograph by A. D. Ferguson.

judgment should be suspended. Its relation to anthrax has been investigated, and the result that in the distribution of the disease the bird must be considered a minor agency as compared with man and various domestic and certain wild animals.

The nature of their food would indicate that buzzards have strong digestive powers. The spores of anthrax, or charbon, a virulent stock disease, have been shown by two independent investigations to be destroyed by passing through the alimentary canals of buzzards. Anthrax spores are not destroyed in the digestive tracts of other carrion-feeding animals, as the dog, cat, hog, chicken, or opossum.

It is true that buzzards may carry the germs of anthrax or other stock disease on their plumage, feet, or bills, and thus distribute them; but all the other animals just mentioned may similarly carry disease germs on the surfaces of their bodies, as may also flies, domestic pigeons and other poultry, horses, mules, and cattle, not to mention members of the human family. In fact, at the same time that steps are being taken greatly to reduce or exterminate a wild bird—the buzzard—which may possibly play a minor part in the transmission of anthrax, farmers are harboring several domestic animals that have far greater possibilities as spreaders of the disease. The fact that anthrax may be carried by flies is more than sufficient to explain the most severe epidemics.

Obviously, it is unfair to attempt to place the blame for general dissemination of stock disease on the buzzard. Considering the multitude of ways in which these diseases may be spread, it can not be doubted that stock diseases would be as widely distributed as now if turkey buzzards were eliminated, as has been proposed. What amounts to proof of this is the fact that hog cholera at times is virulent and seriously destructive in regions where there are few or no turkey buzzards, as in certain northern states and Canadian provinces.

HABITS AND FOOD OF THE ROADRUNNER IN CALIFORNIA.

Results of further investigations of the economic status of nongame birds instituted by the Fish and Game Commission in 1911 have just been published under the title: "Habits and food of the roadrunner in California." (Univ. of Cal. Pub. Zool., vol. 17, no. 5, pp. 21–58, pls. 1–4, 2 figs. in text). For many years sportsmen have accused the roadrunner of destroying the eggs and young of valley quail and a study of the food habits of the bird was ordered. The contents of many stomachs of roadrunners were analyzed, but the results as shown by the following summary do not show the roadrunner to be a serious enemy of valley quail or other birds. Many specimens were secured in localities where quail were breeding but these showed no evidence that quails' nests had been disturbed.

The roadrunner (*Geococcyx californianus*) is unique in many ways. Of particular interest are its breeding habits

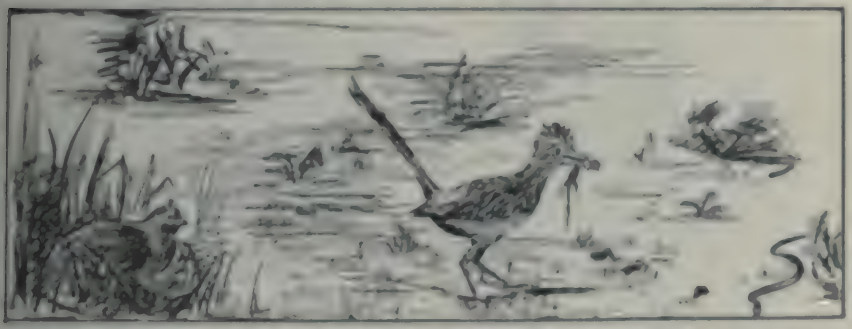
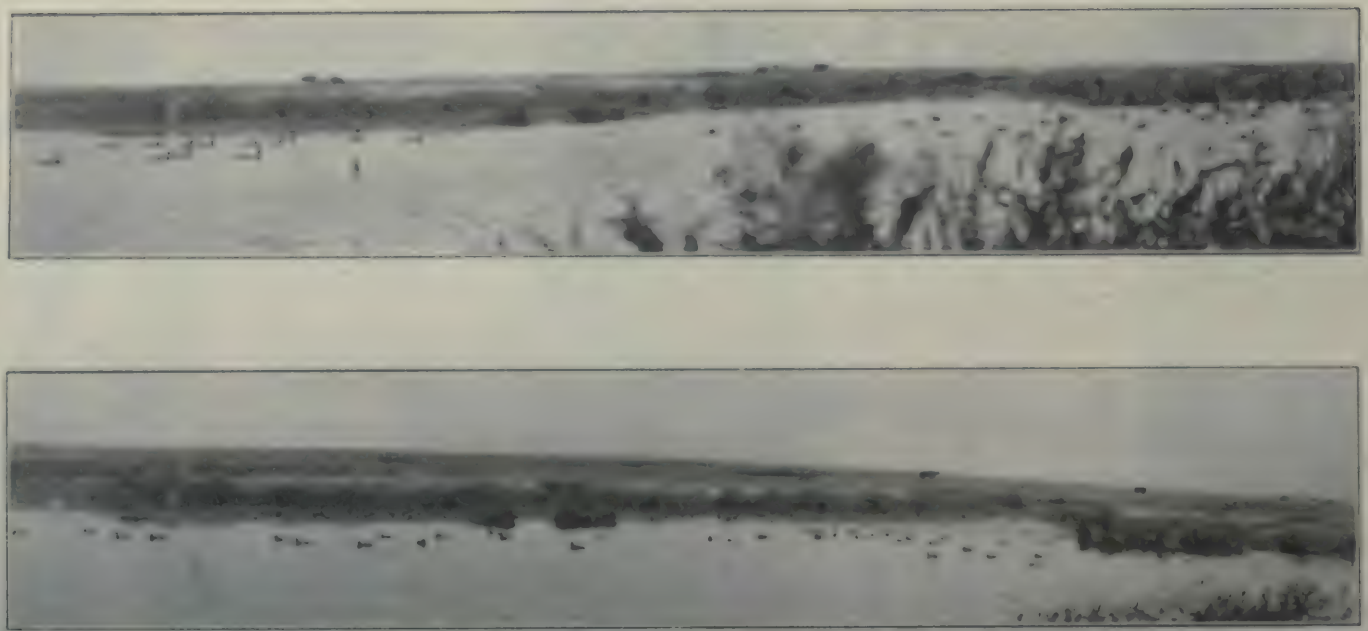


Fig. 10. Apparently the roadrunner has been falsely accused of destroying the nests and eggs of valley quail. Stomach examination has shown that insects, mice, lizards and snakes are fed upon and the eggs and young of birds seldom eaten.



Figs. 8 and 9. Waterfowl in the marshes of Fresno County. Photographs taken on the Thornton Ranch in southwest Fresno County by E. W. Smalley, July, 1916.

and especially food habits. It is doubtful if an investigation of the food habits of any other American bird could have yielded such spectacular results.

The investigation here reported upon included analysis of eighty-three stomachs of roadrunners taken in southern California in 1911 and 1912 and also a survey of all available literature relative to the food of the roadrunner in California.

The eighty-three stomachs represented birds taken every month of the year with the exception of March. The analysis of the stomach contents showed that practically 90 per cent (90.07%) of the total food was made up of animal matter and that slightly less than 10 per cent was of vegetable material. Nearly all of the vegetable matter was of one kind, the fruit and seeds of the sour berry (*Rhus integrifolia*). Insects and certain vertebrates composed the animal food. Chief among the insects found were beetles (18.2 per cent), grasshoppers and crickets (36.82 per cent), cutworms and caterpillars (7 per cent), cicadas and other hemipterous insects (5 per cent), ants, bees, and wasps (4.24 per cent), and scorpions (3.67 per cent). Lizards of three species (3.73 per cent), one bird (1.56 per cent), and two wild mice of two different species, composed the vertebrate food.

The results of stomach examination substantiated rather than altered published statements regarding the food of the roadrunner. From published sources, however, came added information as to the number of snakes and lizards consumed by this bird and practically all of the information regarding its bird-eating habits. One lizard, the whip-tailed lizard (*Cnemidophorus*) appears to be eaten more often than any other species.

The roadrunner's individual capacity for food is great, for an average full stomach contains about ten cubic centimeters of food. The collective capacity, however, is small, due to fewness of individuals. The amount of damage possible (and this must be said also of the potential good) is greatly minimized because there is no concentration of individuals in any one place. A wide variety of food items from small insects to reptiles and mammals is consumed.

Little evidence was obtained that the roadrunner is detrimental to man's interests. The destruction of a few beneficial insects and birds, and of certain lizards usually considered beneficial, can alone be taken as evidence against it. Even if the consumption of a certain proportion of all of the above as food be a fixed habit, the end result is minimized when the facts are taken into consideration that the roadrunner is a bird of the desert regions rather than of the cultivated fields and that the species exists in but small numbers.

A preponderance of evidence favors the bird. The destruction of such unquestioned pests as grasshoppers, cutworms, caterpillars, and wireworms, and of such rodents as mice is to be desired even if the amount of destruction be relatively small. The taking of this sort of food on wild land is evidence that this bird when feeding in cultivated fields is likely to be distinctly beneficial.

Evidently the roadrunner never turns its attention to any sort of cultivated crops as do those birds with granivorous and frugivorous habits. On the contrary, a study of its food habits shows that the roadrunner feeds upon the insect and rodent pests which attack cultivated crops, and furthermore that it destroys hairy caterpillars, a pest not commonly attacked by other birds.

The investigation has also shown that the bird-eating habit of the roadrunner has probably been exaggerated and that the killing of the roadrunner by man as an injurious species is unjustified. The benefits conferred by the roadrunner in

Fig. 11. Downy teal ducks on Lake Elsinore. Photograph by J. H. Geiger, June 4, 1916.

Fig. 12. Decoy geese. Property of "Goose" Lewis of Dixon, California. Photograph by George Neale, May, 1916.

the destruction of insect and rodent pests plus its esthetic value leaves a balance distinctly in favor of the bird and marks it as a beneficial rather than an injurious species.

A "PAT ON THE BACK."

We have scrupulously refrained from publishing the many letters praising the work of the commission which come to the editor's desk, but the following editorial from the Ukiah *Times* for November 1, 1916, is such a fine appreciation that we can not refrain from giving our readers a chance to see it. Such a "pat on the back" is certainly encouraging.

GAME COMMISSIONERS DOING VALUABLE WORK.

"Through the courtesy of the State Board of Fish and Game Commissioners a copy of CALIFORNIA FISH AND GAME for October lies on *The Times* desk. It is the official monthly publication of the commission and the latest issue is the fourth number of the second volume. Not only is the board to be complimented on the contents of the October issue, but the editorial staff deserves commendation for the typographical makeup and neat appearance of the pamphlet.

"When the public realizes that all the commissioners are engaged in a labor of love, serving without financial consideration, the energy, judgment and hard work which they are throwing into their official task will be seen to entitle them to be regarded as mighty faithful servants of the people; this means of the public as a body, for while sportsmen are most keenly interested in the work of the commission, the propagation and conservation of game form a state asset, in the benefits of which every citizen figures.

"Inasmuch as the commissioners draw no salary, *The Times* is of the opinion that they should at least be made to feel that in a measure their reward lies in public appreciation of the value of their services. They are engaged in a large and important work, and the intelligent and faithful performance of their duties will prove of immense value to the state."

OBTAIN AN AUTHORITATIVE WORK ON PHEASANT BREEDING FREE.

Through the courtesy of the American Game Protective Association we are enabled to offer free of charge to game breeders in this state a limited number of copies of E. A. Quarles' authoritative work "American Pheasant Breeding and Shooting." Everyone engaged in pheasant breeding and everyone who contemplates rearing these birds should possess a copy of this book. Make application to Bureau of Education, Publicity and Research, Museum of Vertebrate Zoology, Berkeley, Cal., and include six cents in stamps to cover postage.

GAME BIRDS FOR SALE.

The stock of game birds at present held on the State Game Farm at Hayward will be sold at reasonable prices to game breeders. The species represented are: ring-necked, golden and silver pheasants and valley quail. Ducks of the following species are also offered: mallard, pintail, spoonbill, cinnamon teal, green-winged teal and fulvous tree-ducks. Apply to Superintendent, State Game Farm, Hayward, Cal., for prices.

HATCHERY NOTES.

W. H. SHEWLEY, Editor.

COMPLETION OF HATCHERY OPERATIONS FOR THE SEASON 1916.

On November 7, the fish distribution car left Sisson with the last shipment of trout fry for southern California, and this completed the work of the hatcheries for the season of 1916. While the total number of trout fry distributed during the season of 1916 has been less than during 1915, we believe that, taken as a whole, the results have been more satisfactory. We were able to give the fish a wider distribution this season owing to the fact that we had more hatcheries in operation and were better equipped to hold and rear the fry at the smaller stations. With the improvements made at Bear Valley and Snow Mountain stations, and the construction of Fort Seward and Almanor hatcheries, our facilities for rearing and distributing trout fry have been greatly increased. With Sisson hatchery relieved of a portion of the work of hatching, rearing and distributing the fish, overcrowding of the fry in the hatching troughs was avoided to a considerable extent and as a result those distributed this season were stronger, healthier fish and reached the streams in better condition than in former years.

Improvements made in our distribution car 1, the installation of a larger and more efficient engine and air compressor in car 2 and a better system of the distribution of air in the cans on both cars have been contributing factors in the successful results obtained in fish distribution work this year.

From Sisson hatchery we distributed 1,950,000 rainbow, 1,850,000 eastern brook, 1,725,000 Loch Leven, 950,000 black-spotted, 2,800,000 steelhead and 75,000 German brown, a total of 9,350,000 trout fry.

From Tahoe hatcheries, 209,000 rainbow, 50,000 eastern brook, and 2,765,000 black-spotted, a total of 3,024,000 trout fry, were distributed.

Steelhead trout fry to the number of 490,000 were distributed from Ukiah hatchery and 184,000 steelhead fry from Snow Mountain station.

From Fort Seward hatchery there were distributed 95,000 rainbow, 132,000 black-spotted and 924,000 steelhead, a total of 1,151,000 trout fry.

From Almanor hatchery 202,000 rainbow trout fry were distributed.

From Brookdale hatchery 881,000 steelhead fry were distributed, from Bear Val-

Fig. 11. A rainbow trout, 29½ inches in length. Caught by Mr. and Mrs. Frank Mason of Fresno, at Rose Lake, Madera County. Photograph by R. S. Kimball.

ley hatchery 750,000 rainbow, and from Marlett-Carson hatchery 55,000 eastern brook, making a total number distributed from all of our hatcheries of 16,087,000 trout fry.

A NEW FOOD AND GAME FISH FOR SOUTHERN CALIFORNIA COAST COUNTIES.

During the early spring of 1916 we endeavored to obtain a supply of small striped bass for the southern California coast county streams by seining in San Pablo Bay.

On May 28 a shipment of about 300 small striped bass were obtained and shipped to Senator E. S. Rigdon of Cambria, San Luis Obispo County, who liberated them in Morro Bay at the mouth of Chorro Creek. Several times through the summer months an endeavor was made to continue this work, but weather and tide conditions were not favorable and efforts were not successful. The work was again taken up during the middle of October and, as conditions were favorable at that time, a fine shipment was procured. The seining operations were carried on near Vallejo under the supervision of Deputy H. E. Foster. Deliveries were made to Senator Rigdon, who planted 600 striped bass in the mouth of San Luis Creek, at San Luis Bay, and 400 at the mouth of Corral de Piedra Creek near Pismo, in San Luis Obispo County. The Los Angeles division of the Fish and Game Commission received 2,200 striped bass, and 200 of these were liberated in Anaheim Bay and 2,000 in the lagoon at Sunset Beach, Orange County. A third consignment consisting of 1,800 striped bass was delivered to H. R. Asher, secretary of the San Diego Rod and Reel Club, and liberated in Mission Bay, San Diego County. If the results of these plantings of striped bass are successful, a new and valuable game and food fish will be added to the waters of southern California.

SCREEN AND LADDER OPERATIONS.

During the past two or three months considerable progress has been made in the installation of fish ladders. The following is a list of the ladders that have been completed, which have not been heretofore reported:

The Valdor Mining Company has completed the construction of a fishway over its dam in Canyon Creek, Trinity County.

The same company has installed a screen in its canal diverting water from Canyon Creek, Trinity County.

A fish ladder has been completed over the dam of the Northern California Power Company in Tehama County, at Inskip Ditch, below south power house.

Under the supervision of Deputy J. S. White, a fish ladder has been installed over the Butters Dam, in Big Backbone Creek, in Shasta County.

A ladder has been installed over the Ellsworth Dam in Campbell Creek. This dam is the property of Santa Clara County.

William Shaughnessy has completed the construction of a fish ladder over his dam in Sierra County, in the south branch of Middle Yuba River.

The dam of C. J. York, in Middle Yuba River, Sierra County, has been provided with a fishway.

Overflow and underflow current fish ladders are now under construction over the Mendota Weir, in San Joaquin River, Fresno County. This weir is the property of the Miller & Lux Company.

The Crown-Willamette Paper Company has commenced the construction of a new fish ladder over the Floriston Dam, in Truckee River, Nevada County.

A fish ladder is being installed over the dam of the Anderson Irrigation Project, in Sacramento River, Shasta County.

From recent reports received from Santa Clara County, we find that screens have been installed in irrigation ditches of J. W. Dickson, diverting water from Penitencia Creek; M. D. Knoble of Berryessa; P. Mason of San Jose; G. W. Page, diverting water from Campbell Creek; Sorosis Fruit Company, Campbell Creek; and La Hoydie Irrigation Company, Campbell Creek.

Two new screens have been installed by the Trinity Gold Mining and Reduction Company, in Trinity County. The Western States Gas and Electric and the La Grange Company have screens ready for installation in their ditches in Trinity County as soon as the water is turned in next spring.

A screen has also been installed in a ditch diverting water from the east fork of Stewart's Fork of Trinity River, Trinity County, by Mrs. A. Baudrey.

The California-Oregon Power Company is planning to install a large screen of special construction in its canal diverting water from Shasta River, Siskiyou County.

of the north coast counties well stocked, and it is our intention to also propagate enough salmon fry to keep up the supply of this valuable commercial fish in Eel River.

Work has been completed for the season on Almanor hatchery located at Lake Almanor, Plumas County. A hatchery building 22 feet by 40 feet, equipped with

Fig. 14. A "shad battery" at Yuba City hatchery. The photograph clearly shows the manner in which shad eggs are hatched.

PREPARATIONS FOR NEXT SEASON'S HATCHERY OPERATIONS.

The construction of Fort Seward hatchery, Humboldt County, is nearly completed and we expect to have the station in first-class shape for salmon hatching operations this season.

Improvements have been made in the hatchery building by the installation of new hatching troughs. The hatching troughs and the building inside and out have been painted. The superintendent's residence has been completed and additions to living quarters for assistants have been made.

Fort Seward hatchery will be well equipped for handling both salmon and trout. We will be able to rear enough trout at this station to keep the streams

sixteen hatching boxes and all necessary paraphernalia for operating the hatchery next season, and comfortable living quarters for the employees have been constructed. A large fish-holding tank, fish racks, flume and trap have been built and stored ready for installation as soon as operations are commenced in the spring. The work was finished on November 17.

A small eyeing station consisting of ten hatching troughs has been installed at Domingo Springs.

A large fish-holding tank, racks, flume, trap, etc., have been built and tools and egg collecting apparatus are stored at Rice Creek Spawning Station, near Domingo Springs, ready for installation as soon as operations are commenced. The necessary tent, cook stove and complete

camp equipment have also been stored at Rice Creek station and Domingo Springs.

During the latter part of September the construction of the Rae Lakes egg collecting station was completed. Materials, supplies, tools, etc., were taken to the lake over the Oak Creek Pass and stored in a firmly constructed galvanized iron building 8 feet by 14 feet, which was built during the summer. A supply of provisions was also cached to be used by the assistants next spring when they make the trip in to commence the egg collecting work. Rack and trap material was also taken into the station and preparations made for installing the paraphernalia when egg collecting operations are commenced. It was necessary that absolutely every article for the operation of the station, as well as camp equipment and food for the men engaged in the work, be foreseen and taken in during the summer, as the assistants will have to go into the station next spring over the Oak Creek Pass, via Diamond Peak, the highest point of which is over 12,000 feet, and will be able to pack only their blankets with them.

The rainbow trout eggs taken at Rae Lakes station will be hatched and reared at the new hatchery now under construction on Oak Creek, Inyo County, from which point they will be distributed in the streams of southern California.

On October 1, operations were commenced in an endeavor to obtain a supply of eastern brook trout eggs from Marlett Lake, Nevada. The California Fish and Game Commission and the Nevada State Fish Commission entered into an agreement to cooperate in the work and divide the eggs secured equally between the two commissions. The eggs are taken from tributaries of Marlett Lake, near the lake shore and from Hobart Creek at Red House and transported by teams to Verdi hatchery, where they are eyed and prepared for shipment to Sisson hatchery. Heavy rain and snow storms set in, however, and it was not until October 12 that our assistants were able to leave Carson City, Nevada, on the trip into Marlett Lake. On account of the heavy fall of snow, which was from one to three feet deep, they were unable to get farther than Red House. Temporary camp was made at this place and on the fifteenth the crew went on to the lake on snowshoes. Marlett Lake was found to be covered with a thin coat of ice. As no fish were running, due to the heavy storms and cold weather, the crew returned to Red House, where a few trout were running in Hobart Creek, and where racks and trap had been installed. On the seventeenth, camp was moved to Marlett Lake and racks installed in the largest stream flowing into the lake. The run of

Fig. 15. The McCloud River station of the United States Bureau of Fisheries. It is here that most of the salmon eggs are secured for stocking the streams of California.

spawning fish soon started, but owing to the continuance of the storm and extremely cold weather, the runs at both Marlett Lake and Hobart Creek have been very light and it is improbable that the take of eggs will be large. Up to December 1, 1916, 569,000 eggs had been secured.

MOUNT WHITNEY HATCHERY.

Mount Whitney hatchery, located on Oak Creek, four and a half miles from Independence, the thriving county seat of Inyo County, is nearing completion. This beautiful structure, when completed, will be the most modern and up-to-date hatchery in the world. It is constructed of granite and gabro, and the coloring of the rubble walls blending harmoniously into the background of giant peaks that form the west wall of the valley leaves an impression that will long be remembered. The work of the Department of Engineering on this structure will be completed about January 1, 1917. The hatchery equipment and apparatus necessary to handle the millions of eggs that are to be hatched at this station in the near future will be made by the employees of the hatchery department. The building is 200 feet long by 45 feet wide, and has a hatchery capacity of 6,000,000 eggs. This building is the first unit of a series of modern hatcheries and batteries that will make up this station when the whole plan is finished.

The ample supply of pure water in Oak Creek that gushes from the granite rocks of the basal slopes of the Whitney range is sufficient to furnish this plant with all the water necessary for its development for a quarter of a century.

An almost unlimited supply of eggs can be obtained from the Rae Lakes, if fishing is prohibited in these waters. To insure a supply of rainbow trout eggs for all time, the Rae Lakes basin should be set aside as a state fish preserve during the coming session of the legislature. This can be done by creating a fish and game district of the basin in which the lakes are situated and prohibiting fishing in the district set aside as a preserve. This is necessary to insure a supply of eggs for this new station. When the new trail is completed to the lakes, hundreds of anglers will rush there to enjoy the wonderful fishing that these lakes afford. There are thousands of rainbow trout in these lakes, but to furnish eggs sufficient for a station of the size of the Mount Whitney hatchery, it will be necessary to conserve these fish for spawning purposes.

The importance of Mount Whitney hatchery is best understood when it is realized that the whole of the state south

Fig. 16. Screen installed in the canal of the Northern California Power Company on the Colman Ditch from Battle Creek, Tehama County, California. The screen wheel is ten feet in diameter and the water seven feet deep. Photograph by A. E. Culver.

Fig. 17. A view of one of the Rae lakes. Eggs for the new Mount Whitney hatchery will be secured here.

of the Tehachapi Mountains and as far north as the Yosemite Valley will receive its annual supply of rainbow trout fry from this hatchery. Mount Whitney hatchery is not built for a day or a decade, but is planned for the coming years, as California's fame as an anglers' paradise grows. It will be able to keep stocked those streams depleted by the increasing demands made upon them as the population increases.

COMMERCIAL FISHERY NOTES.

N. B. Scofield, Editor.

THE 1916 TUNA PACK.

The 1916 tuna pack for California will exceed that of last year or of any preceding year, but with all that the year has been a disappointing one for the canners. With a strong demand for all the tuna they could put in cans, nearly all of the packers had improved or enlarged their plants, and more fishermen were employed with the intention of doubling their output if possible. Even with the incentive of a higher price the fishermen were able to take but few more fish than last year. Although the pack is a little larger this year it is certain that the fish were not nearly so plentiful. We will always be uncertain as to what the tuna catch will be, for it is a pelagic fish and its feeding ground and possibly its place of spawning shifts with the shifting currents.

Last year large albacore (tuna) were found to be plentiful far out in the open sea fifty to seventy miles southwest of San Clemente Island. On account of the great distance from the canneries it was unprofitable to go after them with the small boats now employed. This year a few larger fishing boats were built with the idea of going after these large fish, but they did not succeed in locating them.

Some of the more successful Japanese fishermen who have prospected in these off-shore regions believe that fishing "banks" will be found where albacore may be taken the year round. They also believe that the "run" of albacore is not so much a movement up the coast as it is a movement toward the coast from these off-shore banks.

There are a number of reasons for this belief. The fishermen have been unable to follow schools in any extensive movement up the coast. The fish usually appear first well off shore and later move closer in. A school of exceptionally large

albacore will appear at one place and will not be taken later either to the north or to the south. In 1914 a school of very small albacore averaging four and one-half pounds in weight appeared off San Pedro. These fish were not traced either to the north or to the south of this place.

It has been demonstrated that such fish as the herring and sardine of Europe do not migrate up and down the coast as formerly supposed, but that the movement is shoreward from the open sea, and that while the herring are all of one species, each locality has a race of herring that in quality or size is peculiar to and constant in that locality. If there was a general movement along the coast the character of the fish in the different places along the coast would not be constant. The herring on our Pacific coast shows this same race difference in different localities, and it is barely possible that the albacore may be found to exhibit these race differences at different localities along our California coast.

It is of interest to know that the young of the albacore have never been observed. To our knowledge, the smallest albacore captured in California weighed three pounds. No albacore with noticeably developed spawn have been taken by any of the cannery fishermen. The ovaries and spermaries of the fish usually show no development at all and it is only rarely that one with even immature spawn is observed. The largest albacore so far recorded weighed seventy-six pounds. This one, with several others nearly as large, was taken near San Pedro during the last week of October, 1916.

There were 397 fishing boats employed in the tuna fishery this year, each boat being manned by a crew of three. Half of the tuna fishermen are Japanese and this one-half catches 85 per cent of the fish.

A YELLOW-FINNED ALBACORE FROM THE MEXICAN COAST.

A fish sent to us for identification from near Mazatlan, Mexico, has been pronounced by Dr. C. H. Gilbert the yellow-finned albacore, the albacore most common in Japan and usually called the Japanese albacore. It is found in the Hawaiian Islands and a few individuals have been taken in southern California by the fishermen while fishing for the long-finned albacore or tuna. It is reported that these fish are plentiful near Mazatlan.

MUSSELS GROW RAPIDLY.

In investigating the rate of growth of some of the sea animals in Monterey Bay, Dr. Harold Heath, Department of Zoology, Stanford University, found that the sea mussel (*Mytilus californianus*) grows from the egg to a length of three and one-half inches in one year. He found also that both the acorn and goose barnacles reach sexual maturity at the age of eighty days.

Fig. 18. Fisherman's Wharf, San Francisco. Photograph by H. H. Hunt, April 12, 1916.

A COMMERCIAL FISHERIES TAX BILL.

The Fish and Game Commission has prepared a bill, to be introduced at the next session of the legislature, which is designed to increase the revenue of the commission that it may better carry on its commercial fisheries work.

Since the legislative session of 1909, the Fish and Game Commission has received no appropriation from the state, as the revenue derived through the hunting, angling and commercial fishing licenses was deemed sufficient for all the needs of the commission. But with these funds the game patrol service has been greatly extended, the commission's activities have been increased and the output of trout from the hatcheries has been so enlarged to meet the ever-increasing demand for stocking the streams that the revenue derived from the hunting and angling licenses is all needed for these purposes. There is left then for the commercial fisheries the revenue derived from the commercial fishing licenses and the wholesale fish dealers licenses, which together amount to less than $35,000 per year. This amount is entirely inadequate to carry on an effective fisheries patrol; to propagate commercial fishes; to carry on the investigation work so necessary for the conservation of our fisheries; and to pay the fishery's proportionate share of the executive expense of the commission.

In supplying the revenue for the support of the commission, each activity under its jurisdiction should bear its proportionate share. As already stated, the commercial fisheries are not furnishing their proportionate share at the present time, and in the future expansion of the fisheries, which is already upon us, they will fall short still more.

Within the last few years our fishing industries, especially those carried on in the open sea, such as the tuna, halibut, sardine and trawl fisheries, have developed enormously. There is now a very great need of a better fisheries patrol and of a thorough investigation of the commercial fishes if we are to conserve these industries with intelligence. Some of our fisheries are bound to be developed, even without state aid, faster than we can gain the necessary knowledge for their conservation. The people will learn to eat species of fish that are now little used. Our fish are gradually being sent to more distant markets. The eastern United States is now drawing heavily on our salmon, shad, tuna and sardines, and is bound to draw more heavily on these and others of our fishes in the future. The great increase in the demand for all kinds of canned fish is another feature we must recognize if the fisheries are to be successfully regulated in the future. Our most important problem is how to get the most out of our fisheries without injuring the source of supply. In other words, to use the interest without drawing on the principal.

Our fisheries can be adequately conserved only when we have learned the life histories of the different market fishes; when we have learned the effect of the fishing methods in vogue, and when we know how much each fishery will yield without injuring the supply. This knowledge must be applied by framing such protective laws as may be necessary; by enforcing these laws by an adequate patrol service, and by aiding species by artificial propagation where that method is feasible. These are necessary steps that should be completed as soon as possible. They are steps that should be well provided for by the state before a campaign is started to further develop the fisheries. To use a revenue from the fisheries at this time for any but these purposes would be a serious mistake, and any reasonable revenue which they will yield will all be needed to carry on the conservation work now being conducted by the Fish and Game Commission.

CONSERVATION IN OTHER STATES.

PENNSYLVANIA ATTEMPTS TO RESTOCK THE STATE WITH RABBITS.

The attempt has been made by the Pennsylvania Fish and Game Commission to purchase thousands of rabbits from other states to be used in restocking. Although promised carloads of rabbits from Kentucky, none was secured because those who caught the animals put them in a box or enclosure together, with a result that but one rabbit remained the following morning, it having killed the others. An offer of thirty cents apiece f. o. b. at their shipping point also failed to secure rabbits from localities where they were said to be so abundant as to be a nuisance. Instead of tens of thousands of rabbits which it was planned to secure only about 2,500 have been obtained.

Efforts to secure quail have also failed because of the inability to purchase them at reasonable prices.

ANGLERS IN MICHIGAN WORRIED.

Anglers in Michigan are worried over the statement by Dwight Lydell, superintendent of one of the state fish hatcheries, to the effect that although more fish were planted this year than ever before, yet the lakes and streams of Michigan are in serious danger of being devastated of fish. He says: "Fishing seems to be drawing more people every year and the popular varieties of fish are being removed faster than we can plant them with the small appropriation of $80,000 allowed us by the state legislature." Approximately 90,000,000 fish were planted in Michigan this year, as follows: Trout, 6,000,000; perch, 50,000,000; blue gills, 1,000,000; bass, 3,500,000; wall-eyed pike, 25,000,000.

MINNESOTA COMMISSION MAKES USE OF MOVIES.

The Minnesota Game and Fish Department has prepared moving picture films illustrating the artificial propagation of different varieties of Minnesota fish. Films of commercial fishing scenes and bird and animal life also are being prepared. These will be loaned, on application, to responsible organizations, and talks in explanation of the pictures will be given by the commission or the superintendent of fisheries wherever possible.

BUTTON LAW FOR HUNTERS IN NEW YORK STATE.

A new New York game law, among other regulations, provides that all licensed hunters must wear, conspicuously displayed, a button, at least two inches in diameter, to be furnished by the state. In other words, the hunting license must be kept in plain sight.

LIFE HISTORY NOTES.

THE SNOWY OWL AGAIN INVADES CALIFORNIA.

It is a well-known fact that the snowy owl (*Nyctea nyctea*) is of erratic occurrence in eastern states. It now appears that this bird occurs periodically in this state also. Just twenty years ago (1896) a number of snowy owls invaded the northern part of California. Specimens were taken as far south as Bay Farm Island, Alameda County (Cohen in Condor 3, p. 185) and Santa Cruz County (Thompson in Condor 3, p. 141).

During the same year snowy owls were reported as numerous in the state of Washington (Bowles in Osprey 1, p. 81). According to H. G. Smith (Nidologist 3, p. 76) snowy owls were taken in the state of Colorado in 1886.

The following additional data on the occurrence of the snowy owl in California in 1893 has been furnished by H. S. Prescott of Crescent City, Del Norte County:

Ely Charter of Crescent City, Del Norte County, secured two or more specimens, in 1896. One of these was mounted and for many years was in the possession of Mr. Jeffrey, the keeper of the Crescent City lighthouse. H. J. Lattin, residing near Arcata, also saw a number of these birds in that year.

In November, 1916, a male specimen of a snowy owl, secured by Florence F. Williams on the ocean beach near the outlet of Talowa Lake, Del Norte County, was sent us by H. S. Prescott. A second specimen, a female, was secured by Mr. Prescott on November 25 between the north end of Lake Earl and the mouth of Smith River, Del Norte County. Along with this bird was a report to the effect

that Ely Charter had seen nine snowy owls between Point St. George and the mouth of Talowa Lake. Two other specimens are noted as having been taken in the county in a newspaper item appearing in the Humboldt *Times* under date of November 23. Several applications for permits to hold birds in captivity have since been sent to the Fish and Game Commission by parties in the same vicinity who have secured snowy owls alive.

On November 18, through the kindness of George Neale of the Sacramento Division of the State Fish and Game Commission, we received another snowy owl, secured by Edward Bolt of Gridley, Butte County. The stomach of this bird contained parts of a mudhen.

The above is sufficient evidence to show that snowy owls have again made their appearance in California, probably for the first time since 1896. All three of the above specimens have found a place in the Museum of Vertebrate Zoology, where they will be of permanent value to the state.—H. C. Bryant.

DUCKS ARRIVE EARLY.

Ducks arrived very early this season. Several canvasbacks were seen on San Pablo Bay August 20, 1916. Pintails were unusually abundant at this time of year, and a few bluebills were also seen. Deputy Hoen reported to me that canvasbacks were seen on Tomales Bay during the latter part of August.—H. E. Foster.

ONLY A FEW DUCKS DIE AT TULARE LAKE.

The fact that but few ducks have died this fall on Tulare Lake has again upset the theories regarding the peculiar malady which periodically has affected the waterfowl on this lake. If the water of the lake is responsible for the disease it seems strange that last year when the lake was the dryest it has been for some time, only a few birds were found dead. This year, with an abundance of fresh water and the lake 16 to 18 miles across, larger than it has been in years, no serious outbreak of the disease has occurred. On the other hand, in 1910 when the Kings River ran into the lake from the middle of March until the middle of October and the lake was even larger than at present, the largest death toll of any year resulted. It is to be hoped that the decrease in the number of affected birds noted during the past two years will continue and that the trouble is mainly over.—E. W. Smalley.

DUCK DISEASE.

The only place where duck disease has appeared in the Lower San Joaquin Valley this fall (1916) is on a small lake, formed by the overflow from Bull's Slough, on the northern border of Kern County. The lake is located just north of the old Fowler House, a landmark of the country, and is about one mile wide and three and one-half miles long. On the banks along the border of the lake I estimated there were fifty dead ducks to every one hundred feet. When visiting this section on the 21st day of July, 1916, no birds were found. Apparently, therefore, the ducks began dying some time during August.—Tipton Mathews.

GAMBEL QUAIL TRANSPLANTED.

Two dozen Gambel quail (*Lophortyx gambeli*), obtained from Mr. Kenneth Hayward of Thermal, Riverside County, were liberated on Mount Rubidoux, near Riverside, the last of September. The birds were obtained under permit from the Fish and Game Commission. The transplantation was made in the hope that these desert quail would increase and add interest to Mount Rubidoux. The birds will be carefully protected and fed regularly.—J. S. Logan.

UNUSUAL DUCKS VISIT INTERIOR.

Several species of winter visitant ducks, which formerly were seen commonly in northern California and which are now practically unknown or unrecognized by the younger generation of waterfowl shooters, have been observed this season. Ducks of several different species have been brought to the Sacramento office of the Fish and Game Commission for identification. Three are of particular interest: the lesser scaup, or "bluebill," which, twenty-five years ago, frequented the unreclaimed islands of the lower Sacramento; the American goldeneye, and the beautiful bufflehead or "butterball." The goldeneye has even appeared in the markets in Sacramento this year. The wood duck, which nested in large numbers in the timber bordering the banks of many sloughs and rivers of central and northern California, also has been unusually common this winter.

The presence of these ducks augurs well for the future. The present federal and state laws may be responsible for the return of these species. Certain it is that it has been many years since these ducks

have been seen in any numbers in this section.

Quite a number of wood ducks were seen on the opening day of the season and several were killed. Unfortunately, a duck is simply a duck to most shooters, who do not know or care what species of ducks and other waterfowl are protected at all times. Such shooters kill the bird only to learn later that it is unlawful to shoot the same. We have seen a perfectly honorable law-abiding sportsman kill a swan, supposing it to be a goose, and kill wood ducks for teal or other ducks. There is nothing more interesting to the true sportsman than knowing the species, even to the sex thereof, before shooting. No two species fly alike. Every species of duck has its peculiar mode of locomotion. Some use a slow motion of wing, some very fast, as do the quail. The short-winged ducks, such as the teal, goldeneye and ruddy, are not only recognized by their rapid flight but by a peculiar motion all their own that can not be explained or described, but which can not be forgotten when once learned. The movements of birds should be observed closely by the hunter, so that he may tell at a glance what species he is about to kill. The wood duck (which is protected all the year) is one of the easiest of ducks to distinguish, both by flight and plumage. This duck, especially the female, appears to have small spectacle rims on each side of the head, a mark very plainly discernible. Both have plumes on the crown, the male plume being larger than that of the female. The female, when flying, invariably has a peculiar cry as though it were in pain.

More study of the bird and less thought of how many birds one can kill will prove interesting, and, furthermore, will mean the saving of some of the species from extinction. If hunters persist in shooting everything, irrespective of kind, arrest and severe punishment will be used to compel them to have more care.—GEORGE NEALE.

THE MOUNTAIN LION AN ENEMY OF THE SKUNK.

The following evidence bears on the food habits of the mountain lion. Evidently lions do not confine their attention wholly to deer.

On November 8, 1916, our shepherd dog treed a young California lion a short distance below our ranch, near Coulterville, Mariposa County, California. My father, on approaching the lion, which had taken refuge in a live oak tree, noted an odor of skunk. After the lion had been killed the stomach was found to contain a half-chewed skunk, a striped one, judging from the black and white hair found. The lion was only a small one, weighing in the neighborhood of thirty-five pounds.—DONALD D. MCLEAN.

UNITED STATES FOREST SERVICE COOPERATION.

L. H. WHITEMAN, Editor.

QUAIL BECOMING SCARCER IN THE STANISLAUS NATIONAL FOREST.

Mountain and valley quail are getting scarce, valley quail being found in large numbers only in the southern portion of the Stanislaus National Forest. This is probably due to the increased number of hunters who go into the forest each year, and to the use of modern firearms. Also it is a well known fact that hawks get away with a large number of birds, especially in the high country. It is believed here that the mountain quail law should open with that for valley quail, since in some districts the young birds are hardly able to fly on September 1, when the present season opens.—E. D. BACH.

DEER IN THE EL DORADO NATIONAL FOREST.

Forest officers reported 128 deer killed during the 1915 open season within the El Dorado National Forest, and five without the forest, or a total of 133 reported by forest officers who are deputy fish and game commissioners. This number does not equal the number killed during the open season of 1914, which is a strong argument that deer are decreasing in number, and there were many more hunters in the mountains this season than during 1914. A rapid increase in the number of hunters may be expected in the future for the reason that the automobile furnishes rapid transportation to

and from the valley towns. It is recommended, therefore, that deer be further protected by allowing only one buck per man per season, and if in one or two years a slight increase in the number of deer is not seen, a closed season for at least three years should be enacted.—E. L. Scott.

EFFECT OF FOREST FIRES ON FISH.

In the summer of 1915 a very severe brush fire burned off all the brush cover along the headwaters of Tepusquet Creek in the Santa Barbara National Forest. Tepusquet Creek had good fishing in it before the rains came, but the rains that winter poured tons of dirt and ashes off the burned mountain sides into the creek, gullying the slopes badly. The fish holes were all filled up. The dirt and ashes evidently killed every one of the fish. Now the stream has not a fish in it, or any holes for them to live in during the summer if there were any alive.—J. R. Hall.

FOREST OFFICERS DESTROY PREDATORY ANIMALS.

More proof of the value of forest officers as protectors of game is found in a recent report from the Sequoia National Forest which states that two bears, thirty coyotes and five wildcats have been killed during the past year by forest officers.

THE SPIKED BUCK LAW.

The spiked buck law comes in for a good deal of comment from rangers of the Santa Barbara National Forest, as follows:

The spiked buck law is a good one: First, because the bucks are getting very scarce; second, because it causes the hunter to look closer at the deer before shooting, therefore preventing the killing of many does for lack of close observation.—Ranger S. H. Douglas.

The spiked buck law is a good thing in the right direction, and I believe has been universally observed; in fact, there have been very few reports of violations and in every case except one I have reason to doubt the truth of the reports, and I have investigated every report reaching me. The reported violations proved to be some one's suspicions. The presence of plenty of does and fawns and spiked bucks throughout the district is evidence of the integrity of the great majority of the hunters who have been in the field.

I have found a growing sentiment during the last several years in favor of a closed season of from three to five years in length and then a reduction of the buck limit—one buck and the season shortened anywhere down to one day. The sentiment in favor of a closed season has crystallized until I have heard almost every hunter that I have met this season make some such expression.—Ranger H. H. Hunt.

My idea of the spiked buck law is that it is all O. K.; saves more does than any law ever passed. The opening and closing of the season could not be better. The trout season is all right just as it is and the quail season also.—Ranger S. J. Rhyne.

BOY SCOUT COOPERATION.

NEW YORK SCOUTS TOLD HOW TO CONSERVE WILD LIFE.

[The following is the advice given the boy scouts of New York State by John B. Burnham, president of the American Game Protective Association. Scouts of California! Can't you make use of some of these ideas? What birds mentioned by Mr. Burnham are not found in California? Honorable mention will be given the California scout who sends in a correct list.—Editor.]

CONSERVATION AND WILD LIFE.

Conservation is preservation. It is founded on frugality and unselfishness. As applied to game and forests it does not mean that game shall not be killed nor trees cut down when needed for use, but it does mean that there shall be no wanton destruction and no unnecessary waste.

Only useful things must be taken as required, and then only when not in conflict with the right of others. Beautiful objects in nature must be spared and protected. Birch trees must not be marred by peeling the bark. Shrubs and trees must not be hacked and defaced. Names or signs must not be chiseled on rocks. Above all, beautiful and useful birds and mammals, not classed as game, must be protected with

the same spirit with which we protect our own good names.

Our natural resources are given us "in trust, for the benefit both of the present and the future. We must render an accounting of the trust to those who come after us."

CERTAIN CARDINAL PRINCIPLES.

1. Way back in Deuteronomy we are told not to molest a bird on the nest. This is the earliest game law and the most fundamental. All creatures must be protected during the period of rearing their young. Otherwise extermination will result.

2. Do not let anybody rob bird nests. Protect the immature things from predatory creatures. If you have a cat which kills birds, put a bell on its neck and do not let it roam the fields, particularly in the nesting season.

3. Do not be a game or fish hog, and do not let others take more than a reasonable or legal limit. Sometimes the legal limits are too large, and sometimes there are no legal limits imposed. Here your moral powers should be exercised to prevent excess. Supplant the fallacy that nothing succeeds like success with the finer principle of sport for sport's sake. Taking game and fish with gun and rod in moderation is manly sport, but it is still finer to study the wild things and to secure as trophies photographs which are tokens of greater skill in woodcraft.

4. It is now illegal to sell almost every kind of game in almost every state in the Union. New York prohibits the sale of all game except rabbits and certain propagated and imported species. The market hunter is thus eliminated, but in some places game is still illegally sold by resort to subterfuge.

5. You can do much to preserve the game and birds by providing cover for them and food. Plant barren tracts with trees which can be procured from the Conservation Commission for three or four dollars a thousand. Plant also barberries and haws and other food-bearing shrubs which can be procured at small cost from commercial nurseries, or plant even cherry stones and apple seeds and willow suckers. You will have the satisfaction of seeing something grow where nothing grew before, and the knowledge that you have done something of value to posterity.

6. Many birds and animals die in cold weather from temporary causes. Often they need only a trifle of food to supply their needs till the snow settles, or the ice melts from seed-bearing weeds and shrubs. Here much good can be done by distributing suitable grains or other food in the swamps or other places in which wild life resorts. Read "Wild Bird Guests" and other books which give information on this subject.

7. Know the game laws. Remember that all wild birds in the state are protected at all times, together with their eggs and nests, except English sparrows, starlings, crows, hawks, crow blackbirds, snow-owls, great-horned owls and kingfishers, and the game birds.

The birds classed as game are limited in number in this state and it is an easy matter to learn the list. They are the waterfowl, including geese, brant and river and sea ducks; the marsh birds, including rails, coots, mudhens, and gallinules; the upland game birds, including grouse or partridge, pheasants and quail; and the shore birds, such as woodcock, snipe and plover. Knowing the birds which may be killed, it is easy to be sure of those which may not be killed and, thus informed, to prevent others from taking the lives of those cheery and useful friends of humanity. To know when game birds are being killed illegally, however, it will be necessary to study the state closed seasons.

A SAMPLE OF THE WORK OF ONE SCOUT.

[Here is a sample of the interest taken by one Scout. Scout Marriott is out after that prize and the rest of you will have to hurry.—EDITOR.]

SANTA MARIA, CALIFORNIA,
October 26, 1916.

State Fish and Game Commission of California.

DEAR SIRS: In regard to your game magazine, of which we received a copy, I notice it speaks chiefly about deer and I will tell you a few more things we find to be true.

One reason why our deer are lessening in number is because some of our citizens

kill deer before the season opens, kill does and fawns whenever no one is around that they know of and many kill more than two a season. This can easily be done, we find, by the hunter killing one, then after that is gone and if he has not been noticed by some ranger or game warden, he will throw the horns and skin away and go after his two deer which he says he has a right to kill. This is often used, I fear, and something should be done to stop it.

Another solid reason why our deer are few in numbers is because of the puma or mountain lion, which preys upon the deer. These beasts, I and many others find, kill on an average of ten per year, and a bounty of about $100 ought to be paid for the skin of a lion. There is only one good thing that the puma is good for and that is his fur; therefore, it would do no harm if they were entirely exterminated.

Yours truly,

(Signed) PAUL MARRIOTT.

SANTA MARIA, CALIFORNIA,
September 4, 1916.

State Fish and Game Commission,
Los Angeles, California.
To whom it may concern:

On your game laws (1915–1917), I find you have the dove season opening on September first.

This opening season date for doves I find does not give the parent birds time enough to hatch their young.

A week ago I was on a little hike by myself. I discovered three dove nests, one with eggs and the other two with baby doves about a week old in them. As this is a fine dove country there must be many more nests with the same aged occupants.

Yours truly,

PAUL MARRIOTT.
Tenderfoot Scout, Troop 1.

SANTA MARIA, CALIFORNIA.
October —, 1916.

State Fish and Game Commission
of California.
To whom it may concern:

In regard to the English sparrow or European house bird I find that in this district the bird nests from four to seven times a year and usually has from four to six eggs.

Its nest is very poorly constructed, and as it builds in some corner, nook or ornamental fixtures, it not only spoils the appearance of the building but has often caused fires.

In the fruit counties this bird nips the buds in spring, kills young birds of the song variety and fills air with its non-musical chirp. There seems to be only one bird that can hold its own with the English sparrow and that is the blackbird.

We have great difficulty in planting lawns here because as soon as the seeds are sown the pests arrive and they soon leave patches of bare ground.

I have built a nest box in my yard and the best way I find to exterminate them is to let them nest, then one by one break up the eggs. In this way the birds soon leave the nest and the box is soon filled by another couple which by the same way may be gotten rid of. Instead of taking them all at one time the parent birds can be caught and killed and the eggs also destroyed.

I have killed fourteen English sparrows since the troop received your letter.

If there is some better way of getting rid of them or anything else I can do for the Fish and Game Commission please let me know as I would like very much to have the honor of getting a pair of pheasants.

Yours truly,

PAUL MARRIOTT.
Tenderfoot Scout, Troop 1.

CALIFORNIA FISHERY PRODUCTS FOR THREE MONTHS ENDING JUNE 30, 1916.

Species of fish	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Sacramento, San Joaquin	Alameda, Contra Costa	Solano, Yolo	San Francisco, San Mateo	Santa Cruz	Monterey	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego	Other counties	Mexico	Total
Albacore											404,653		1,335			405,988
Anchovy			98,775		825		2,771		21,780		2,442					123,594
Barracuda								347		56,900	717,434	13,937	306,903		164,959	1,259,580
Bonito																
Bonnetto							4,331		47,493							51,824
Blackfish																
Chilipepper									17,581							17,581
Carp			2,915	4,454	20,357	20,730	36,036							1,748		86,200
Catfish		3,077			35,190	15,347								525		54,139
Codfish									1,771							1,771
Cultus cod							35,395	40,088								75,483
Dogfish									9,722							9,722
Flounder	2,204				14,646	962	95,896	91								113,799
Halibut	4,035		127				1,278	6,737	3,006	15,000	886,859	14,008	13,673		271,243	916,376
Hake							35,446	450	146		140					36,182
Herring			628,427		1,575		7,106	870	41,283		3,229					682,490
Kingfish							26,760	59,030			98,072	262	2,539		525	184,218
Mackerel									583		182,104				970	183,657
Mullet																
Pike				1,301	329									105		1,825
Pompano							246	1,167	117		5,795	155				7,482
Perch	1,650		3,759		948		2,630	3,337	6,326		2,370				260	26,480
Rock bass		833									64,337	12,278	161,232		34,970	273,650
Rockfish	1,660		29,934				103,437	22,602	200,770	6,805	298,891	4,886	235,152		39,509	943,646
Sole							484,835	406,287	7,972		1,969		455		225	901,773
Salmon	8,776	1,200	115	150,742	284,250	370,659	1,984	81,032	3,323,887		35			15,265		4,217,938
Smelt	11,486		8,904		2,348		125,972	10,761	35,026	16,780	39,615	2,353	5,991		340	259,286
Sea bass (white)			167					104	250	6,971	63,305	146	7,234		10,577	88,398
Sea bass (black)											5,168		7,631		3,325	16,124
Sand dab							213,084	155,600	1,296		5,357	28				375,365
Striped bass			429	32,707	88,717	61,421	84,530	222						128		268,244
Shad				86,669	2,806,418	809,125	94,147	68						10,760		3,807,187

CALIFORNIA FISHERY PRODUCTS FOR THREE MONTHS ENDING JUNE 30, 1916—Continued.

Species of fish	Del Norte, Humboldt	Mendocino	Marin	Sonoma, San Francisco	Alameda, Contra Costa	Solano, Yolo	San Francisco, San Mateo	Santa Cruz	Monterey	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego	Other counties	Mexico	Total
Sturgeon	120			1,200	1,968	728	100							179		4,295
Sardine	45						1,198	202	231,988		17,300		100,007		14	347,754
Skate							25,927				286	75				26,288
Sculpin								70			1,192	179				1,571
Sea trout											228	10				248
Tom cod							5,118									5,118
Trout (lake)													1,610			1,610
Turbot			21													21
Whitebait		35	6,745				53,547									60,327
Yellowtail											265,076	221	27,374		8,000	300,671
Miscellaneous	5,243	409	275,450	491	275		10,431	288	6,509		29,561	14	1,325	18		329,215
Total fish	35,219	5,345	1,026,775	277,934	3,327,800	1,288,992	1,492,196	780,613	3,907,506	102,356	2,796,276	48,635	999,211	25,728	534,695	16,513,576
Crustaceans																
Crab (dozen)	2,354						6,127	6,100	908							15,589
Spiny lobster															10,252	10,252
Shrimp							99,267									99,267
Fervelse		1,740														1,740
Molluska—																
Squid									50,127		5,482					61,609
Cuttlefish							237	6,102	1,502							7,841
Clam (Pismo)								3,600		41,855						45,455
Clam (cockle)		574	25,339							396	1,976	1,576				29,940
Clam (softshell)		5,582	182,180		31,931		7,144									227,337
Clam (mixed)	6,200	1,695	1,674					75	60		1,468					11,172
Oyster (shell), No.							2,474,253									2,474,253
Abalones		4,120						1,201	180,704	16,224						302,429
Mussels		85	597				367		186	1,283	5,889					8,407
California oysters			5,346													5,346

N B.—The figures denote pounds, except where otherwise stated. Salmon, codfish, and whale products from distant waters, brought in by boats operating out of California ports, while rightly belonging to California fishing products, are not included in the table.

CALIFORNIA FISHERY PRODUCTS FOR THREE MONTHS ENDING SEPTEMBER 30, 1916.

Species of fish	Del Norte, Humboldt, Etc.	Mendocino, Lake	Marin	Alameda, Contra Costa	Sacramento, San Joaquin	Alameda, Contra Costa	San Francisco, San Mateo	Santa Cruz	Monterey	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego	other counties	Mexico	Total
Albacore											4,125,710	132	3,488,972			7,614,814
Anchovy			54,460				21,880		54,700		27,365					182,925
Barracuda								10		24,589	94,670	6,822	25,871		14,440	166,722
Bonito									83,521		119,621		31,116			234,258
Corbina							120	1,730								1,850
Croakers																
Flatfish								1,857	3,008							5,440
Flounder														3,117		34,892
Herring				1,000		24,267	5,678									9,257
Jackfish		97			7,610	1,250										6,660
Jewfish								1,660	4,545		415					75,075
Cultus cod	1,222						26,276	27,002	11,346	261	62					4,695
Kingfish			4,247								325		118			72,469
Flounder	200						72,220				405	7				1,032,763
Halibut	58,704		101				1,858	2,191	10,287	7,602	219,229		215		773,676	61,719
Hake							21,700	6,220			15,815	7,654				2,226
Herring									2,125		270					166,221
Kingfish							36,207	18,960	62,277	22	41,775	139	1,318			394,428
Mackerel									3,904	10,095	285,593	1,473	4,023			9,467
Mullet								60					205	9,202		811
Pike						75	736									2,302
Pompano							60	594	19		1,300		29			9,018
Perch		7	5,576				1,063	2,467	630		1,265	30				389,125
Rock bass										15,835	221,139	4,573	137,578			842,271
Rockfish	3,806	962	595				227,721	76,460	249,422	27,445	240,174	2,586	13,079			1,204,361
Sole							288,226	620,712	8,531	20	2,510		60			3,036,896
Salmon	125,352	1,849	2,806	464,038	142,008	667,652	234,737	67,149	1,274,686	89						254,254
Smelt	9,754	99	4,554			90	77,127	23,174	26,277	24,036	40,307	9,030	8,925			432,866
Sea bass (white)			13,041			635	96,749		30,153	5,896	80,328	96	1,391		215,797	26,095
Sea bass (black)											5,746		20,349			547,350
Sand dab							228,480	259,940	8,060	4,080	5,823	597				146,792
Striped bass		1,708	32	5,641	1,315	37,484	91,197	106						190		75,321
Steel				6,380	12,280	31,880	2,760	28						1,393		1,624
Sturgeon	825				171	650	278									

CALIFORNIA FISHERY PRODUCTS FOR THREE MONTHS ENDING SEPTEMBER 30, 1916—Continued.

Species of fish	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Solano, Yolo	Sacramento, San Joaquin	Alameda, Contra Costa	San Francisco, San Mateo	Santa Cruz	Monterey	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego	Other counties	Mexico	Total
Sardine			8,150				2,010	16,349	3,757,686	1,265	18,675		4,568			3,806,006
Skate							14,130									14,130
Sculpin											737					737
Sea trout											634					634
Tom cod							12,937									12,937
Trout (lake)														67,273		67,273
Turbot			400													400
Whitebait			15,196				38,759			225	182,592					236,742
Yellowtail										2,559	15,005		112,073			123,137
Miscellaneous	1,708	910	32,945	275	18		17,506		3,444			196	1,144	20		58,463
Total fish	185,604	5,714	173,233	480,424	214,975	785,354	1,832,950	1,167,803	5,586,099	125,930	5,697,894	32,237	3,541,224	81,200	1,006,923	21,275,859
Crustaceans—																
Crab (dozen)	547	6					2,291	763								3,609
Spiny lobster															121,265	121,265
Shrimp							127,027									127,027
Ecrevisse		492														492
Molluska—																
Squid			125				108	225	109,926		105					110,519
Cuttlefish							2,713	134	121							2,968
Clam (Pismo)										51,671						51,671
Clam (cockle)		460	15,589								7,102					23,151
Clam (softshell)		2,020	49,708			42,973		5,855								101,556
Clam (mixed)	6,040	560	2,500			106	1,350			50						10,606
Oyster (shell), No.							3,294,345									3,294,345
Abalones								500	187,634	1,392						189,526
Mussels		210	165				4,469			1,242	7,120					14,246
California oysters			6,004													6,004

N.B.—The figures denote pounds, except where otherwise stated. Salmon, codfish, and whale products from distant waters, brought in by boats operating out of California ports, while rightly belonging to California fishing products, are not included in the table.

VIOLATIONS OF THE FISH AND GAME LAWS.

September 1, 1916, to November 30, 1916.

Offense	Number of arrests	Fines imposed
Game.		
Hunting without licenses	39	$555 00
Deer, close season—killing or possession; excess bag limit one season	17	365 00
Female deer, spiked bucks, killing or possession; not retaining horns of deer; illegal deer hides	13	550 00
Nongame birds, killing or possession	17	185 00
Ducks, close season—killing or possession; excess bag limit	23	1,125 00
Shooting ducks from power boat in motion	9	75 00
Using a live or imitation animal blind	5	125 00
Night shooting	12	215 00
Geese, excess bag limit	1	
Grouse, close season—killing or possession	1	40 00
Shore birds, close season—killing or possession; offering for sale	15	215 00
Quail, close season—killing or possession; excess bag limit, trapping without permit, shipping in concealed package	5	175 00
Cottontails, close season—killing or possession	2	50 00
Total game violations	159	$3,675 00
Fish.		
Angling without a license	7	$125 00
Fishing for profit without a license	18	175 00
Striped bass—underweight	5	145 00
Dried California shrimp in possession	1	
Illegal fishing apparatus	9	20 00
Spot-fin croakers, buying and selling	2	40 00
Trout, excess limit, undersized offered for sale	3	25 00
Catfish, undersized offered for sale	1	12 00
Young of fish, taking or possession	3	20 00
Crabs, close season—taking or possession	4	25 00
Clams, undersize	1	25 00
Abalones, undersize	3	40 00
Lobsters, undersize and oversize	5	90 00
Taking fish within 50 feet of fishway	1	
Total fish violations	63	$742 00
Grand total fish and game violations	222	$4,417 00

SEIZURES—FISH, GAME AND ILLEGALLY USED FISHING APPARATUS.

September 1, 1916, to November 30, 1916.

Game.		
Deer meat	333½	pounds
Hides	9	
Ducks	4,278	
Geese	1,158	
Quail	173	
Doves	8	
Shore birds	6	
Nongame birds	5	
Rabbits	26	
Fish.		
Striped bass	525½	pounds
Trout	48½	pounds
Dried California shrimp	4,160	pounds
Spot-fin croakers	1,435	pounds
Crabs	672	
Clams	100	
Lobsters	55	
Abalones	33	
Miscellaneous fish	8½	pounds
Illegal nets	10	
Searches.		
Illegal fish and game	111	

STATEMENT OF EXPENDITURES FOR THE MONTHS OF JULY, AUGUST AND SEPTEMBER, 1916.

General administration	July	August	September
General Administration—			
General administration	$1,554 44	$2,111 26	$2,398 78
Research, publicity and education	194 70	379 71	219 56
Printing	178 04	700 74	329 47
Fish exhibits	219 10	295 00	629 21
Game exhibits		1 80	165 11
Game farm	279 36	365 91	199 02
Mountain lion bounties	180 00	120 00	280 00
Lithographing hunting licenses		21 00	
Lithographing anglers' licenses			7 50
Hunting license commissions and refunds	1,101 80	521 00	2,451 00
Anglers' license commissions and refunds	1,603 70	848 20	1,078 90
Market fishing license commissions and refds.	49 50	50 00	28 50
	$5,702 61	$5,123 11	$7,802 08
Patrol—			
San Francisco District	$5,558 33	$5,739 30	$5,734 82
Sacramento District	4,611 98	4,698 98	3,962 76
Los Angeles District	1,867 80	1,879 49	2,112 86
Launch patrol	817 35	824 47	980 01
Prosecutions—fish and game	129 47	90 80	71 70
Crawfish inspection	100 00	100 00	100 00
Winter game feeding			
Accident and death claims		7 00	
	$13,084 93	$12,734 42	$12,627 15
Department of Fish-culture—			
Hatchery administration	$919 27	$790 50	$785 76
Mount Shasta Hatchery	2,407 03	2,375 70	3,221 72
Mount Shasta Auxiliary Stations			59 05
Mount Whitney Hatchery	1,116 11	283 67	224 01
Mount Whitney Auxiliary Stations	186 85	59 77	64 50
Tahoe Hatcheries	374 74	286 19	256 16
Tahoe Hatcheries Auxiliary Stations			
Marlett-Carson Hatchery	21 40	32 73	9 20
Fort Seward Hatchery	490 96	529 23	474 52
Ukiah Hatchery	175 43		
Snow Mountain Station		27 69	99 46

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IN MEMORIAM.

JOHN PETER FISHER.

John Peter Fisher, game expert of the California Fish and Game Commission, with headquarters in San Francisco, dropped dead while hunting in the marshes near Los Banos, on Sunday, November 26, 1916. Apparently there was no presentiment of death, as he left home in his usual health and was as cheerful and jocular as ever.

Mr. Fisher was a native of San Francisco, being of a pioneer family. His father came to California in 1848, and settled in El Dorado County in the early sixties. Mr. John P. Fisher married Miss Summerfield of El Dorado County, and two children were born to them: a daughter, who died when quite young, and a son, whose tragic death by accidental shooting occurred when the young man was but eighteen years of age.

John P. Fisher was a lover of nature. He knew the woods, the birds, and the animal life of northern California as thoroughly as few men have come to know them. He was an exceptionally well-informed man. Always reading, observing and studying, he was able to thoroughly discuss a wide range of subjects. He held many positions of trust, where an expert knowledge of men and conditions was essential. For many years he was connected with the timber interests of El Dorado and adjoining counties, and the people of El Dorado County twice elected him to the position of county clerk. He was prominent as a national guardsman, and as such was recognized as one of the best shots in the United States, his possessions including many medals and trophies won in open competition.

He was known and loved for his genial disposition. Few men could number the sincere friendships accorded to him. No matter how he may have felt; no matter his secret troubles or sorrow, it was always a smile and a cheerful word from John P. Fisher.—W. A. Gett.

PAUL SMITH.

The following fitting words were spoken at the funeral of Paul Smith, one of the commission's trusted deputies, by Assistant Executive Officer J. S. Hunter:

"It has been my privilege to be associated for several years with the man whom we today have come to pay our last tribute of love and respect. I want to emphasize that it has been a privilege, for it is seldom that in all the multitude of people we come in contact with each day, that we find one in whom we can entrust every confidence as we could in him.

"In my association with him it was a pleasure to study the true nobleness of character, sincere integrity and high regard for duty that permeated his entire being. No duty was too severe, no task too hard; never complaining, always giving the best that was in him, his life was such that we can take from it a lesson that will make us all better men.

"To the wife and baby girl I would leave this word: Do not think of him as dead, but as one who has left all trials and troubles behind and who now rests where there are no sorrows, no partings, but, in their place, eternal peace. His memory is with you. Take consolation from the fact that his life was upright, his character sterling, his every act above reproach. He lives in your memory and in the memory of his friends and those who loved him."

CALIFORNIA FISH AND GAME

"CONSERVATION OF WILD LIFE THROUGH EDUCATION"

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AN UNFAIR ATTITUDE ON GAME LAWS.

By FRANK B. HOFFMAN.

I recently attended a trial held before a justice of the peace in one of our mountain districts, the defendants, three in number, being charged with a violation of the game law. As to the result of the trial in as far as it affected the defendants, I have nothing to say, but I was forcibly impressed and immeasurably shocked at the utter lack of respect shown by some of those present for the officers of the court, and the openly expressed sentiment against the arresting officials. The idea seemed to prevail, as it does in other small communities, that because of the nature of the case the proceedings were to be something on the order of a vaudeville performance, and at least 50 per cent of those in attendance showed by their attitude that they were there to contribute their share toward the entertainment. I will not dwell upon this case, except to remark that instances of this kind have a demoralizing influence upon the community in which they occur, for contempt for, and disregard of one law and its representatives, soon leads to contempt for another law and the officers appointed to enforce it.

I do not attempt a defense of the game warden, for neither he nor his position need defending, but I wish to register a vigorous protest against the unfair attitude assumed by a certain element of society toward these capable representatives of one of the greatest movements ever inaugurated for the benefit of the present and future generations. The populace turns out en masse to assist other officers in the capture of wrongdoers, and even the vile desecrator of the sacred hen roost is considered legitimate prey, all citizens, high and low, lending their best effort to aid in his apprehension. The officer who effects his capture is publicly lauded for his zeal and bravery, and where his office is elective, he is unanimously returned to office because of his record as an efficient officer. But because of some strange inconsistency in the human makeup, we place the game warden in a little niche by himself and deny him the whole-hearted support that is the due of every officer, regardless of which branch of the law he represents.

The admirable and conscientious manner in which the majority of these men perform the duties assigned to them, speaks well of their physical and moral courage, for it is a lamentable fact that in some districts the sentiment against them is so hostile that they must possess these qualities to a high degree.

Even the hardened criminal recognizes the necessity of law and order, although he may look with disfavor upon the laws which affect his particular line of endeavor, and while he will resort to any measure to avoid capture, once he realizes that resistance is useless, he submits

to arrests and entertains nothing but the friendliest feeling toward his captor. But in most cases, violators of the game law make their arrest the basis of a bitter hatred for the man who brings them to task, considering it in the light of a personal affair between themselves and the game warden, seeming to forget that he is but an instrument of society. A certain calibre of chronic offenders voice their hostile sentiments in very forceful language, endeavoring by threat and presentation of a warlike front to intimidate the resident game deputies. It is interesting to note the source from whence these threats emanate. In every case, the salient features of the physiognomy of the one who utters them proclaims the fact that his mental peregrinations do not extend beyond bounds usually referred to as "narrow."

In some districts it is a difficult matter to secure a jury who will deal fairly with the people in these "game trials," and men of high standing, who consider themselves law-abiding and upright members of their community, will resort to every subterfuge to avoid jury service in these instances. Sometimes they are moved to this as an act of business or social diplomacy or because of the fear of incurring the ill will of others. Others, who can and will qualify as jurors in the trial of any other case, seem, upon these occasions, unable to adjust their mental processes in a manner which will enable them to lay aside their personal feelings and opinions.

Citizenship carries with it certain responsibilities, which, in all fairness to ourselves and our fellow man, we must not shirk. I consider jury service one of the most solemn and high duties we are called upon to perform, and while it is, at best, a disagreeable duty, we can not deliberately avoid it without feeling that we are shirkers. It is discouraging to the game wardens, when, after the conscientious performance of their duty, they are denied support from the quarter from which they naturally expect it. I refer particularly to the lack of cooperation in some districts upon the part of the district attorney and other county officials. However, if I am correctly informed, it is possible to proceed with the prosecution of a case without the assistance of these officers, and I believe it would be an excellent thing could these trials be held before any justice of the peace in the county, when, owing to the strong sentiment against game protection, it is impossible to secure a fair minded jury in the locality where the offense is committed.

Our game is one of our most valuable assets. It is the means of bringing to our state thousands of dollars annually which otherwise would go to states more favored in the line of game, and laying aside all other considerations, from this standpoint alone it is to the interest of every man and woman within the boundaries of our state to lend their hearty support to any movement that has for its objective the preservation of our game. Society has appointed representatives to enact its laws, and as long as these enactments remain upon the statute books they must be observed and upheld by all, and the ones who are delegated to enforce them, instead of being anathematized and condemned, should receive the moral and active backing of every citizen.

Every true sportsman should cultivate the acquaintance of the local representative of the Fish and Game Commission in the district where he usually hunts or spends his vacation. He will find the deputy a good man to know. As a general rule he is a veritable encyclopedia of

information pertaining to things that are of interest to all lovers of the great out-of-doors. He can tell one where the best hunting and fishing is to be had; point out the best camp ground, and be useful in innumerable small ways that I am sure will be highly appreciated.

I hope to see the day in the not distant future when the true status of our game wardens will be firmly established in the public mind, and the warden will be accorded the respect to which the dignity of his office entitles him.

Meet him on the open ground of good fellowship; extend to him the hand of welcome when he favors your camp with a visit, and as he is usually the possessor of a pleasing personality, he will, if afforded an opportunity, win your good will and friendship.

STRIPED BASS FISHING.

By C. M. Boutan.

My first experience angling for striped bass was sixteen years ago. After several fishing trips to San Leandro Bay, where I caught nothing but sting-rays, I succeeded in hooking a two-pound bass in San Pablo marsh near where the city of Richmond now stands.

The clam was the only bait used at that time. The preparation of a clam for a bait consisted in taking it out of the shell and splitting the neck lengthwise, the idea being to make a pocket of the neck, for the clam belly is soft and comes off the hook easily when cast. The hook was run through the little hard teat on the belly, then through the belly and twice through the neck lengthwise.

Our fishing was confined to the sloughs and good catches on some occasions were made.

In July, 1901, Al. Wilson perfected a bass spoon which he brought to San Pablo to try, and it was my good fortune to be there fishing at the time and to see the results. Mr. Wilson informed me that the spoons would be on the market shortly, and upon securing one I made a hasty trip to try it out. Large numbers of bass were occasionally caught with this spoon, both in the sloughs and on flats outside in San Pablo Bay. But the striped bass is a queer fish and on some days it would not strike the spoon. The fish were small, ranging from one to four pounds, but occasionally a larger one was landed.

A couple of years later some men tried trolling for bass in Raccoon Straits and secured a nice catch, so several of us went over to try our luck. Fishing was so good that we formed a club known as the "Pacific Striped Bass Club" and purchased an ark, which we still maintain at Belvédere. There were two distinct runs of bass in that neighborhood, one in March and April, the other in September and October. Seldom was a fish caught under five pounds and from that up to fourteen pounds, with a few as large as twenty pounds. Two men generally fished together, using the "armstrong" motor. Rod holders were clamped to the sides of the boat to hold the rods. It was ideal fishing, with plenty of excitement, especially when two fish were hooked at the same time, which often happened. The fishing was mostly done close to the rocks.

A good many bass were being taken in San Antonio Slough in Marin County at this time on bait, but I made only a few trips up there, with poor results, although I have seen men returning from San Antonio with all the bass they could carry.

Five years ago it was found that the small crabs of the species *Cancer magister* were fine bait. The water in Carquinez Straits and Petaluma Slough and at Benicia and South Vallejo was alive with them. Where they were present, a clam used as bait would not last a half minute. A man who had used crabs for bait in the East showed us how to prepare them. Break off all the legs, cut the edge of the shell all around and lift off the back, then break off the two lower parts of the shell and you have one of the best striped bass baits. A large hook, seven or eight 0, is used and the bait is put on whole. When bass are taking crabs well they seemingly taste the bait first, then grab it and run.

A 35-pound striped bass that it was my good fortune to catch in Petaluma Slough had in its stomach a crab about five inches across the back. At another time a 12-pound bass was found to have devoured thirteen small mud crabs, called "fiddlers."

An arrest was made for having small *Cancer magister* crabs in possession, which put a stop to their use for bait. They are a real nuisance when fishing with other bait and the few that would be used would be nothing to the numbers that die each year when the freshets come down the sloughs adjoining Petaluma Slough.

A large crab of lawful size can be used, but it must be fresh and uncooked. A dozen good baits can be made of it.

The salt water bullhead is the predominating bait at the present time. The head and tail are cut off and the hook, a number four or five 0, is put into the throat from the inside.

Some men strike with the line when the fish grabs the bait, while others have the clicks on the reel fixed very light so it runs easily and the fish is allowed to run with the bait from 20 to 100 feet or until it is thought he has swallowed the bait. The fish is then hooked in the stomach or throat. A fish so hooked does not put up as good a struggle, in most cases, as one hooked in the mouth.

Monterey sardines are used a good deal for bait, also herring. They are cut into chunks or split lengthwise. Fishing with herring one night in January, 1913, in Petaluma Slough, I landed 125 pounds of bass in three hours, the largest fish weighing thirty-six pounds.

During the summer months the fishing in San Pablo Bay, Napa River, Petaluma Slough and their adjoining sloughs is mostly carried on by trolling with spoons, and during that time the fish are usually small, although an occasional large one is caught. It is in winter the bass run large and they are then caught on bait.

The largest bass caught with rod and reel was caught by William West of Napa, in the Napa marshes, on a spoon September 26, 1911. Its length was 51 inches, girth 31 inches, weight 62¼ pounds.

Seemingly, there are millions of striped bass in San Francisco, San Pablo and Suisun bays and the rivers and sloughs flowing into them, and with the protection that the Fish and Game Commission is giving them there is no danger of their being depleted

THE EFFECT OF POWER DEVELOPMENT ON FISHING CONDITIONS IN THE HIGH SIERRAS.

By A. D. Ferguson, Field Agent, California Fish and Game Commission.

The construction of great dams across natural streams for the purpose of diverting or storing its waters, gives rise to difficult and trying problems in the way of providing for the free movement of ascending migratory fish over or around such artificial obstructions. To devise a fishway which will enable fish to surmount a dam a hundred or more feet high is no mean engineering feat. Such problems the Fish and Game Commission must solve. It can, and does, happen, frequently, that the construction of a great impounding dam works a very decided improvement in fishing conditions. The major streams of the high Sierra Nevada mountains of central California occupy deep canyons and their tributary waters tumble more or less directly over canyon walls. The minor or tributary streams of the high Sierra region were, because of impassable falls in their lower courses, naturally devoid of fish life. Most of the feeder waters of the river systems of the vast Sierra watershed have been stocked with trout through the agency of man's enterprise, but while there are fish in the main streams and tributaries, the chief movement of fish life as between main streams and feeders is downward and not upward.

The impounding dams now in the Sierra Nevada mountains have been constructed either in connection with hydroelectric power development or as an aid to economical lumbering and are located on tributary streams high above the main rivers. In the first instance the site was chosen for the double purpose of securing a large area for the impounded flood waters and of securing a great perpendicular fall for the piped water in a short lateral distance. In the second instance, the lumberman makes his reservoir nearest his standing timber. And thus it comes about that some people seeing a high dam across a stream where fish are found above and below such dam wonder (and sometimes complain) that the Fish and Game Commission has not compelled the construction of a fishway to enable ascending migratory fish to pass over the obstruction. The unusual conditions existing in such cases minimize the necessity of aiding the fish to ascend the stream. Furthermore, the artificial lake above the dam has made room for thousands of fish where dozens could have existed before the construction

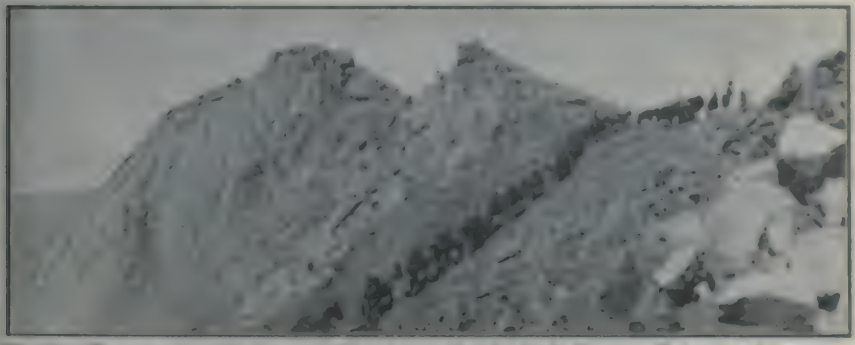

Fig. 19. Transportation by means of pack trains in the high Sierras. By using this means of transportation it is possible to plant many streams otherwise inaccessible. Photograph by A. D. Ferguson.

Fig. 20. Concrete dam across Big Creek Gorge in Fresno County. The water impounded forms Huntington Lake. Photograph by A. D. Ferguson.

Fig. 21. A fishing scene in the Sierras. Photograph by A. D. Ferguson.

of the dam. Typical instances of how commercial enterprises have benefited a natural resource and given pleasure and profit to thousands of people, in a way their projectors never dreamed of, are to be found in eastern Madera and Fresno counties.

Before the San Joaquin Light and Power Company, taking advantage of a natural site, impounded the flood waters of the Crane Valley watershed, North Fork Creek in Madera County supported but a few trout and apparently had no future as a popular trout stream. The building of Crane Valley Dam made Bass Lake. This beautiful sheet of water, some six miles long, a half mile wide and a hundred feet deep, is now teeming with both trout and black bass. A popular

Fig. 22. Bass Lake (Crane Valley Reservoir) in eastern Madera County. Power development was responsible for the formation of this fine body of water. Photograph by A. D. Ferguson.

summer resort is upon its banks and hundreds of campers annually visit its shores.

Stevenson Creek in Fresno County, stocked in 1888 with black-spotted trout, would never have furnished an incentive to visits by anglers, had it not been for the construction of the "Shaver" Dam by the Fresno Flume and Lumber Company. In an old-time biennial report of the (then) Fish Commission, it was stated that a careful survey showed that Stevenson Creek could never become a trout stream of consequence. Now, and for many years past, Shaver Lake, formed by the construction of a dam just above the point where Stevenson Creek starts tumbling 4,000 feet in four miles down into the San Joaquin River, is the mecca of thousands of people from the San Joaquin Valley, who, in summer, camp upon its shores and enjoy the good fishing to be had there.

The latest instance of how a high and impassable dam can sometimes prove of great benefit to the people's fishing interests is at Huntington Lake in Fresno County. Big Creek, stocked with rainbow trout in 1897, soon became a good fishing stream to the few people who in that day found its waters. In the then little known back country, its

isolation was its protection. In the year 1911, came the Pacific Light and Power Corporation, with thousands of workmen, to invade the solitudes of Big Creek Basin. At the lower end of the basin, at the head of the gorge through which Big Creek falls some 2,000 feet in a trifle over a mile, the company built a huge concrete dam. At first but 120 feet high, the dam is now being raised to a height of 150 feet. It impounds 150,000 acre-feet of water, and to the stock of rainbow trout already in the creek, the Fish and Game Commission has added several hundred thousand Loch Leven, eastern brook and rainbow fry. A mountain railway and a county wagon road permit an annual influx of several thousand people from all over the state to the shores of beautiful Huntington Lake. A fine hotel and many lesser ones are already located there. The Forest Service and the county of Fresno will jointly build a scenic road along the north shore of the lake during

Fig. 23. Huntington Lake, Fresno County, elevation 7,000 feet. Photograph by A. D. Ferguson.

the coming summer, and the playgrounds commission of the city of Fresno has selected a site on the lake shore where it is planned to give annual outings to 5,000 children.

Here, as elsewhere, the fishing is the chief lure which draws so many people to the mountains, but there is little danger of the fish supply becoming depleted; for not only will the lake support and harbor vast numbers of trout, but each spring, from out its depths, will emerge big, strong, spawning fish to ascend every tributary stream and the process of natural reproduction will go on to replenish the annual drain.

Other notable examples of the incidental (or accidental) benefits which may follow the building of high impounding dams across mountain streams, are the Highland reservoir in Calaveras County, the dam at Strawberry and the big dam at Relief, both of the latter being in Tuolumne County.

MY FIRST TRIP INTO BIG BEAR VALLEY IN THE SPRING OF 1916.

By W. C. Malone, Deputy Fish and Game Commissioner.

On the 18th day of April I received instructions from the Division Office at Los Angeles to take two men and go to Big Bear Valley to rescue the fish that were going from the lake into the mountain streams to spawn, it being stated to me that large numbers of fish in passing up the streams were becoming stranded and that they no doubt would perish unless some provision was made for getting them into deeper water.

Realizing that it was a job that would call for men who were used to roughing it and who were not afraid of cold water or hard work, two men bearing the names of Dotts and Welch were secured. We got into the valley on the 20th of April, 1916, and found that the streams running into the lake were alive with trout that weighed from two to ten pounds.

The storms of the winter had filled the mouths of the streams running into the lake with sand and debris, and the large fish, in attempting to get up the streams, would get stranded in the shallow waters at the mouths, and being unable to get either up or down the streams, became easy prey to both man and beast.

We worked for the first fifteen days rescuing these fish off the sand-bars and placing them back in the lake. During this time we were assisted by Mr. Phillips and Mr. Morrison of the fish hatchery at Big Bear Lake, and a Dr. Getchell, who was stopping in the valley at the time. I believe that our work saved for the people of the state of California thousands of fish that would have otherwise died, been destroyed by animals or clubbed and speared by violators.

Probably the experience at the lake this spring has been the common experience around the lake, for I have been told by old-timers of Bear Valley that they used to haul fish out by the wagonload in the spring season, and anyone who knows anything about fish when they are spawning knows that they fall an easy prey to the man who wants to pick them up, as they are at that time very tame and can be easily handled, particularly while they are stranded in the shallow waters.

During the excessive floods of 1916 the lake filled up until the water ran over the top of the dam several feet, carrying immense numbers of large trout out of the lake and into Bear Creek. After the storm was over we estimated that there were between three and five thousand fish in the creek which had been washed over the dam during this storm, each weighing between two and ten pounds. Later, when the season opened, the anglers had great sport trying to catch the large trout in Bear Creek. They used their light tackle which they had been in the habit of using for brook trout, but made very little progress in catching these big lake trout in the stream, and as one fisherman expressed himself: "When you hooked a fish he would shake his head, and if he didn't break a hook, line or leader, he would brace himself against a rock, give a lunge, and away he would go!"

We had a very successful opening of the fishing season in Bear Lake this year. A great many fish were caught and some very nice ones.

The only thing to mar the success of the opening was the roughness of the waters of the lake, which made it very dangerous for fishermen to go on the lake in small open boats. I did all that I could do to keep the fishermen from the more dangerous portions of the lake during that day, and persons who went on the lake in the open boats had to make shore the best way they could. A great many people do not realize their danger in going on these mountain lakes in open boats in the early part of the season. As the weather is more or less rough and the waters are extremely cold, after a person is once thrown in the water he has very little chance of getting out alive, as the experience of four men who drowned in Little Bear Lake on the opening day of the fish season in 1916 proves.

WHAT WE CAN DO TO PROMOTE FISH CONSERVATION.*

By Charles Minor Blackford, M. D.

Perhaps no country in the world possesses more societies and associations for the promotion of various ends than does the United States, and yet the small success that attends the labors of these organizations must attract the notice of anyone who looks into the matter. In every state, in many counties and in every city or large town, we find medical societies and other scientific or semiscientific bodies that are trying to teach the people at large how to better their physical condition, and yet in many cases, their influence is negligible. It was only after the brilliant object lessons given by the altered hygienic conditions in Havana and on the Canal Zone, that the mass of our intelligent people became convinced that the mosquito is anything more than a trivial nuisance and that the housefly is a menace to life, although the medical societies had been preaching these facts to unheeding ears for several years. When the truth was brought home to the people, however, they grasped the situation, and the tables of mortality already show the results of the campaign now being waged against these domestic enemies.

The reason why these bodies of learned and experienced men have so small an influence on the people around them may be summed up in the single word, ignorance. This popular ignorance and its twin offspring, prejudice and vanity, must be overcome before any marked results can be effected. Mere legislation will not accomplish much. Along our special line, the conservation of fishes, there is ample legislation—indeed in some instances there is too much—but the legislation is not accomplishing its end and we should try to find out why it is not doing so. Many of the laws on the statute books are not wise and would not accomplish anything if they were enforced, but the principal reason is lack of enforcement, and it is here that ignorance and its offspring, prejudice, come into play. One of the wisest of the writers on law has said that "He who knoweth the law and knoweth not the reason of the law, knoweth not the law; for the reason of the

*An address delivered before the American Fisheries Society, 1915. Reprinted from the Transactions American Fisheries Society, December, 1915, pp. 15-18.

law is the life of the law," and we must teach the mass of the laity the reason of the law if we wish to put life into the law and get hearty cooperation in its enforcement.

The greatest obstacle that we encounter in doing this is the vanity of the American people. For more than a century it has been a mark of so-called patriotism to claim that the resources of our country are inexhaustible, and anyone who called attention to the danger of extravagant wastefulness, was considered an hysterical alarmist or almost a traitor. In consequence of this foolish talk, we are now seeing the end of our forests, and geologists are estimating, with alarming accuracy, the length of time that will elapse before our stores of iron and coal will be exhausted. National and state governments are frantically taking steps to check the ruthless destruction of these reserves of natural wealth before it is too late, but their efforts will bear scanty fruit unless the people be shown that the wonderful wealth of our country is not limitless. When this is grasped, and not until then, conservation will become an accomplished fact.

When America was first being settled by Europeans, the abundance and variety of the fisheries of both the salt and fresh waters made a deep impression on the colonists. The Grand Banks fisheries played no small part in causing the adjacent continental shores to be colonized, and the fishes along the coasts and in the rivers supplied the colonists with a large part of their food during the earlier years of the settlements. The widespread belief that this resource was inexhaustible led to such reckless destruction that the fisheries began to decline, and about the time of the Civil War the shad catch had diminished to such an extent that its restoration was one of the main reasons for the establishment of the United States Commission of Fish and Fisheries, the predecessor of the present Bureau of Fisheries. Following the example of the national government, many of the states have established commissions charged with the duty of restoring or increasing their respective fisheries, and it is a part of the duty of our society to aid these commissions in the accomplishment of their task.

This can best be done by arousing the interest of the people in the work, and as said above, this can only be done by spreading abroad knowledge of the economic value of the fisheries and showing that in preserving them, something more is intended than merely restricting the rights of the fishermen. Our society can do good work in this direction, both as individuals and as an organization, and I want to make a few suggestions as to how we may go about it.

At the meeting of the Fourth International Fishery Congress, held in Washington in 1908, O. M. Dennis, former state game warden of Maryland, gave some reasons for the failure of fish protective legislation, and among them he placed the selfish jealousy of sportsmen and commercial fishermen in regard to bills introduced by either class. He said that this being true, "The country members of the legislature, as well as the fishermen themselves, look with suspicion on any measure presented to the legislature which has for its purpose the protection of fish and game when such measure is presented by city men." Unfortunately this is true, and it is not confined to Maryland by any means. The antagonism between country men and city men is so

widespread as to be almost universal, and among the rural population there is a general opinion that game protective laws are designed to furnish sport for city men at the expense of the rights of the country people. For this reason the game laws are very commonly looked on as something very much like acts of tyranny, and disobedience of them is regarded somewhat in the light of heroism. It should be remembered that laws are but the crystallized expression of public opinion, and if there be no public opinion favoring a law, or if public opinion be opposed to a law, merely placing a legislative act on the statute book will not produce any result. It is therefore necessary to create an enlightened public opinion in favor of laws for the conservation of fishes, and when this is done the enforcement of the laws will be both easy and effective.

Our society can aid in the development of this public opinion both as a collection of well informed individuals interested in this movement and as an organization. Our members come from many of the states of the Union, and among them are state and national officials, college professors, commercial fishermen, scientists and sportsmen; in brief, every aspect of the fishery question is represented among us. We are not sectional and we have no selfish nor class interests to serve, and consequently we are in better position to spread the knowledge of fish life among the people than would be any trade organization or even a purely scientific society. As individuals it would be well for us to write papers for the press; not merely for the big city papers, the sporting magazines and the fish trade journals, but for the country weeklies that go out among the masses of the rural population. If we were to write articles that are scientifically accurate; that are interestingly put, and above all, are not "in a tongue not understanded of the people," many of our members would be surprised to see how eagerly they will be read and what an effect they will produce. One of the main reasons that societies such as ours have so little effect on public opinion is that the subjects that we discuss and the language in which we discuss them are uninteresting and unintelligible to most of the people outside of our own narrow circle. It is hard for us, who have given much of our time and effort to the acquirement of a special line of knowledge, to appreciate that what is merely elementary to us is an unknown and fascinating world to many intelligent men outside of the ranks of professional naturalists. How many of these people could tell how a fish egg is impregnated and how it develops? How many can tell anything of the life history of even the commonest fishes? The knowledge—if indeed it can be called knowledge—that most persons have of such subjects is a mass of traditional lore, resting on misinformation as a basis, that is so far from the truth that to call a tale a "fish story" is equivalent to saying that it is false. By putting the known facts of fish life clearly and accurately before the intelligent people of our country, we would make hundreds of practical students of the natural history of fishes where none are today, and nearly every one of them would become an active aid in the conservation movement.

Another method of advancing our purpose is to have our members give talks before school children. Many, if not all, of the school superintendents will welcome the chance of having some well-informed man or woman give one or more talks—we need not dignify them by calling them lectures—before the children on this subject, and by so doing the interest of the coming generation will be aroused. The recent Boy Scout movement offers another opportunity. Teach these boys how the black bass or the brook trout spawn; if possible show them some of the eggs during their development, and the boys will become ardent protectors of the spawning fish and not destroyers of them. They will see that the despised city sportsman is a pretty decent kind of fellow after all, and they will teach their parents and their neighbors the value of fish conservation.

Finally, what can we do as a society to arouse greater interest in our avowed objects? We can take a hint from one of our sister societies, the National Geographic Society. We should remember that there is nothing in which any intelligent man is interested that may not be made an object of interest to any other intelligent man if it be properly put. We are far too prone to discuss technical matters that are of great interest to us as biologists and fish culturists, and to forget that these topics, although of great value, are of no interest to the masses unless we try to make them such. At first glance it would seem that there are few subjects less interesting than the cold, bare facts of geography, but by putting these facts attractively, the National Geographic Society has built up one of the most entertaining magazines in the country, and has enrolled a membership of thousands. We might do something of the same sort. We might try to issue a magazine of popular ichthyology that would cover the scientific, the commercial and the sporting sides of our subject, and by having the articles written simply, clearly and accurately, spread the influence of our society throughout the land. We would replace the ignorance and misinformation that now prevail by clear, concise and accurate knowledge, before which the obstinacies and prejudices that now oppose us would disappear. We would enlist thousands of eager students of all ages and sexes to battle for fish conservation, and we would make our society a power in the land. Many of our members are easy and graceful writers, and I feel certain that enough of them would be willing to contribute articles to such a journal that would make it authoritative and valuable as well as interesting and entertaining, and, should the experiment succeed, we would have the consciousness of having performed a valuable service to our country.

TRINITY NATIONAL FOREST GAME REFUGE.

By E. V. Jotter, Chief Forest Deputy.

The Trinity National Forest Game Refuge (Fish and Game District No. 26) situated to the east and south of Big Bar, Trinity County, includes approximately 65,000 acres, of which 2,377 acres are alienated land.

The area extends from the head of a little gulch on the north, at an elevation of approximately 3,500 feet across the Trinity River (elevation 1,300 feet) over Hayfork Bally Mountain (elevation 6,000 feet),

Fig. 24. Lookout on Hayfork Bally, highest point on the Trinity National Forest Game Refuge (District 26). From this section can be heard practically all gunshots within the refuge.

across Hayfork Creek (elevation 2,000 feet). This range in elevation and the south exposures afford both summer and winter range, so that game need not leave the refuge at any time. The area also includes a number of licks much frequented by deer.

An almost equal distribution of timber and brush types is to be found, the latter usually being found on the steep south or west exposures. The timber includes both fir and pine types, the latter having

the most browse and grass feed. Brushfields are largely of manzanita, white thorn, and mountain mahogany, although such browse feed as oak and blue brush is also common.

At present 365 cattle and 14 horses are grazed here by 17 permittees. Very few campers use this region solely for the camping, but in the past it was a favorite hunting ground. After the completion of the down-the-river road, there will undoubtedly be much travel through this refuge, and quite probably more camping along the road.

Deer are found throughout this area, quite generally distributed throughout the summer and fall, and living at the lower elevations during the winter and spring. It is also thought that some of the deer that winter here regularly travel out of this region during the summer and early fall. It is estimated that the average number of deer found here during the summer does not exceed 1,500 head.

Mountain lions move about a great deal, but there are very few within this area and possibly 40 to 50 bears and 150 coyotes make this region their home. Mountain and valley quail and grouse are scarce but squirrels are abundant.

As already stated, this region affords excellent summer and winter feed and because of this reason, as well as the favorable climate and low snowfall along the river, forms splendid breeding grounds. Water is abundant, salt licks are convenient, and there is plenty of early feed.

This region has always been recognized as a good hunting ground and it was so extensively visited in the past that the number of deer was being seriously reduced up to several years ago. Since game laws are being observed more generally deer are increasing. Although no unusual number of game violations have occurred in this region there have been several violations for such reasons as killing doe, more than two a year, or hunting without a license. Local hunters can still use this region with very little risk of detection, but it is not so easy for outside hunters to go alone or in a party without being apprehended. The establishment of this refuge created a safe place for breeding deer to supply a great area of surrounding country. There should be but little reason for any persons except stockmen to roam about within the refuge, and consequently there should be less danger of fire through carelessness by individuals.

The employment of a man to devote his entire time to this area would permit the close supervision necessary to keep out all but those having a legitimate reason to be in the area. Naturally there should be a good check on those who go into the refuge, so that only responsible parties who will be careful with fire, can enter.

At present the only supervision exercised is that done in a general way by Deputy Laws and whatever incidental patrol and supervision can be given him by forest officers. This refuge is fortunately located in that the district rangers at Hyampom, Hayfork and Big Bar are near the main trails of the refuge and the lookout on Hayfork Bally can hear any shots within a part of the area. However, these men exercise only incidental supervision and only two of the number are on duty all year. It would seem advisable, therefore, for an experienced man to be stationed on the refuge all year at a salary of

$100 per month (the man furnishing his own subsistence and horse feed).

The extermination of predatory animals should fall largely to the patrolman who could kill such animals as coyotes during the summer and trap or poison them during the winter. Probably $25 a year would cover the cost of traps, ammunition, poison, bait, etc., used in this

Fig. 25. Cañon Creek Falls, Trinity County, typical of Trinity County mountain scenery.

work. A patrolman can do more to increase the deer by destroying predatory animals, especially coyotes, than in any other activity, not excepting unlawful killing of deer.

Winter feeding is sometimes necessary and would cost from $25 to $50, as we can assume that under this protection the game would increase and require more feed during periods of stress. The proper

protection of the existent species of game and bird life will be all that is necessary to fully restock this area.

Sentiment of the local public is not favorable toward this idea of a game refuge, as it is believed by most of the people that there really is not need for closing any area to legitimate hunting. They believe that all that is necessary is to exterminate the predatory animals, to enforce the game laws in general and particularly to curtail the killing of more deer than is permitted by hunters who travel by auto from county to county, killing their full quota in each.

THE CASE OF THE SPORTSMAN vs. THE CASE OF THE FARMER.

[The following contrasted opinions regarding the relation of the farmer to game are of peculiar interest. Both quotations are from Eastern men. Fortunately, California is practically free from this conflict of interests which complicates the cause of game conservation in Eastern states. Those who never carry a gun have here actively espoused the cause of game protection and are taking part in bringing about the proper kind of laws. And the sportsman is sacrificing his own immediate good for the perpetuation of the game supply. The farmer is as a rule cooperating in preserving wild life, even to the extent of artificially feeding it. Only occasionally is one found who takes the same point of view as Mr. West. The cause of game conservation demands a harmonizing of all purely individual points of view and a wider outlook which shall encompass the benefit of all—not of any single class. The sportsman and the farmer must ultimately meet on common ground and work together for a common end—a policy of conservation which shall ensure the greatest good to the greatest number.—EDITOR.]

Dr. Joseph Kalbfus, Executive Officer of the Pennsylvania Fish and Game Commission (Bull. No. 2, Pennsylvania Fish and Game Comm.), defends sportsmen thus:

"The necessity for additional protection to our wild beneficial birds is beyond question, yet, strange to say, those from whom, because of their professions, we expect the most (churchmen) and those who derive the most from the life work of birds (farmers) have up to this time done comparatively nothing for the birds.

"Fortunately for the birds, as well as for the state, there are certain people taking an interest in this matter, and strange to say, those who have up to this time done most for the birds are those who in the public mind are supposed to be bird destroyers, and known as sportsmen. In the face of this opinion, I assert without the fear of successful contradiction, that every law upon our books today giving protection to wild birds, either game or otherwise, was put there at the instance, or through the influence of sportsmen. They are the men who have said through legislative enactment that certain birds known as song and insectivorous birds, because of the value of their life work, shall not be killed at any time, and that birds known as game birds shall be killed only during certain periods and in restricted numbers, and they are the only men who have insisted upon and assisted in the enforcement of the statutory provisions relative to these subjects. They are the men who today are supplying through the Resident Hunters' License Act the sinews of war through which protection is given not only to game birds and animals but also to song and insectivorous birds, and without the help of which the labor of the farmer would, in the majority of instances, be profitless. In addition to this, they [the sportsmen] are providing the fund through which the farmer is paid a bounty for killing a weasel or other vermin that may be found destroying his poultry. They are the men who today are providing the cash to pay for grain used in feeding game and other birds during severe winter weather, in many instances they are paying for the labor necessary to place this grain where the birds may get it. Some few farmers are feeding birds during the winter time, or are at least permitting the birds, such as quail, that happen to come into their barnyard, to partake of the grain scattered for their poultry, but the great majority of farmers are not feeding or caring for the birds in any way. I have been collecting statistics regarding this matter for years, and know

whereof I speak. I have found but few farmers, who, unless they were also 'sportsmen,' when the deep snows of winter have come, will take a bag of grain on their backs and hunt up the starving quail to feed them, but upon the contrary, many farmers, in action at least, say to the quail, 'I know you are hungry and I have the grain to feed you, but if I give you that grain, worth a dollar a bushel to me, you will in all probability go over onto my neighbor's property, and he will either kill you or get the benefit of your life work, so I guess I'll stay in by the fire at home and keep my grain.' Along comes the sportsman, very likely traveling in a hired rig, who buys this very bushel of grain, feeds part of it to the birds the producer of the grain has refused or neglected to feed; part of it he feeds to birds on the neighboring farm. He keeps the birds alive, for not one would have survived the winter without his care; yet when he comes in the fall with gun and dog to take a part of what he has saved, he finds a trespass notice on almost every tree and post. The farmer who has done nothing to save the birds, in great big letters says 'KEEP OFF,' and I wonder who will care for these birds next year."

Alfred C. West, writing in *Recreation* for September, 1915, defends the farmer's point of view thus:

"The farmer is also interested in game protection. He sees the young pheasants in his meadows. When he is near he makes a little side trip to see how they are getting along. In the old brush lot he sees an occasional rabbit scurrying down the bushy path. In the woods he watches the gray squirrels in play and their bickerings and thinks what a shame it is to kill them. He hears the quail whistling and the partridge drumming or sees the young ducks swimming around the bend of the creek and it seems good to be alive. A little later the hunting season opens but the farmer's work is pressing so that he can not get out in the woods that day. He hears the steady cannonading in woods, meadow, swamp and brush lot. He sees the automobiles rush past his place or stop in his yard, with or without a request that he care for them 'for a little while.' Perhaps a neighbor telephones in that his stock are out in the road where some party of 'sportsmen' has left a gate open or perhaps even cut his fence. It may be that a favorite cow comes to milking time, blind in one eye or bleeding all along the sides from the charge of shot of a man who may have been nervous or only drunk. A few days later he may get a few hours when he can go hunting, but everything is changed. The young pheasants are all killed. The squirrels can not be seen. Indeed, with all his exact knowledge of the habits of the game on his land he is indeed fortunate if he can get one or two shots. If he tries to protect himself under the trespass laws, he finds that the courts will not uphold him. • • •

"All this brings us to a realization that the game is decreasing largely because the farmer feels that it is not to his interest to have it do otherwise. It has already been shown how the mere presence of game is often the cause of a money loss to the farmer. • • •

"How may the game be increased? It will be evident to any one that the game of the country can not be protected if the farmers are not willing to give active assistance in enforcing the game laws and few farmers will give any active aid while they are made to feel that a reduction in the number of game animals on their lands is a distinct advantage. • • • If the farmers could have the benefit of a good trespass law and could be allowed to get profit in some way, if only by the sale of hunting permits, from the presence of game on their lands the disappearance of the game could be stopped. The present game laws seem to the farmers to have been made by and in the interest of men who want to get something for nothing and let the farmer pay for it, and until this condition is remedied laws may be piled on laws *but the game will keep on its present road to oblivion.*"

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April 15, 1917.

THE NEW COMMISSIONER.

On December 8, 1916, Mr. Edward L. Bosqui of San Francisco was appointed fish and game commissioner to succeed Carl Westerfeld, who was elected at that time to the office of executive officer of the commission. Mr. Bosqui is a son of Edward Bosqui, a pioneer printer and publisher of San Francisco. The present commissioner, like his father, is a lover of field sports and has found recreation in fishing and hunting since his boyhood days. This long experience with the fish and game of California makes of Mr. Bosqui a most valuable ally of the men who hunt and fish and of those interested in wild life conservation. Acquainted with the out-of-doors as few men are, he brings to his new position a knowledge of conditions that is sure to count for better fish and game conservation. His slogan is: "More fish and game for all of the people."

NEW GAME LEGISLATION.

As in past years there has been much interest taken in the fish and game legislation before the present legislature. In all 60 senate bills and 106 assembly bills relative to fish and game were introduced during the month of January. Some of these bills are constructive conservation bills; others would tear down much of the protective work of past years.

Noticeable among destructive bills are those relating to the taking of protection from such nongame birds as the red-shafted flicker or "yellowhammer," the meadowlark and the blackbird, and the taking of protection from ducks and geese in certain areas where it is claimed they are causing damage to rice. Provisos in our laws already stipulate that crops may be protected from the depredations of nongame birds. At least four bills provide for extensive bounties on predatory birds and animals. One bill sets aside $80,000 for bounties, and still another, one-fourth of all hunting license fees. Any such step would be a backward step, judging from the experience of other states. The bounty system has nowhere been a success except in those rare instances where a single animal of uncommon occurrence is the one on which a bounty is paid. In almost every case where the bounty system has been tried it has resulted in fraud and misrepresentation and in an early depletion of the public treasury.

A number of bills of constructive character have been introduced by the Fish and Game Commission. Many of them are amendments to existing laws and are designed to make enforcement easier. For instance, the laws protecting beaver and sea otter have been amended to include green skins as well as the possession of the animals themselves. During the past two or three years two attempts at conviction have failed owing to the inadequacy of these two laws. Amendments have also been made to the Bowman law, so that game breeding can be

encouraged rather than discouraged. Regulations for the shipment of game so as to avoid the smuggling of game to the market by means of parcel post is another important amendment.

New laws of interest are:

The trappers' license law, designed to give a record of the fur-bearing mammals taken in the state; the taxidermist's license law, providing for the supervision of those who mount trophies of the hunt; a law prohibiting shooting from an automobile; an act providing for the revocation of licenses of convicted violators; and one providing for a closed season on the black bear.

A still more important bill is one that provides for the establishment of seventeen new game refuges to be located in national forests. With the refuges already established these new ones will complete a chain extending from the Mexican line to the Oregon line.

TWO FUNCTIONS MUST BE PERFORMED BY FISH AND GAME COMMISSION.

A study of the various state commissions and their service to the state shows that each commission has two prime functions: (1) law enforcement; (2) education and publicity. For example: The State Horticultural Commission is primarily engaged in the enforcement of the quarantine laws. In addition, it is important that this commission educate ranchers to recognize injurious insects and to furnish information as to the latest and most efficient means of protecting crops from the ravages of insects and disease. The State Board of Health is responsible for the enforcement of certain quarantine laws and other laws involving the public health. On the other hand, this same board continually carries on educational and publicity work to help the people to recognize and combat infectious disease.

Fig. 26. Fishing on the north fork of the Feather River. Photograph by F. A. Parnum.

In a like manner, the State Fish and Game Commission is under obligation to carry on, in addition to work in law enforcement, educational and publicity work necessary to acquaint people with the fish and game laws, and to make them take sufficient interest in fish and game to properly conserve it.

The second function of a state commission is the more constructive and fundamental. Consequently it is deserving of wider attention than it has yet received.

SEVENTEEN NEW GAME REFUGES FOR CALIFORNIA.

If a measure proposed by the Fish and Game Commission is passed by the pres-

ent legislature, California will lead all the states of the Union in the number and acreage of its game refuges. It is becoming more and more apparent that one of the best means of conserving game is to establish game sanctuaries, where predatory animals are destroyed and other wild life is allowed to breed unmolested. Game increases rapidly in such sanctuaries and the increase spreads out to neighboring territory, where it furnishes food and sport to all who seek it.

With the cooperation of the United States Forest Service, seventeen areas in the Sierras and Coast Range have been selected and recommended as refuges. With the new refuges and those which have already been set aside, in addition to the several national parks, California will have a series of sanctuaries extending from the northern boundary to the Mexican line and covering in all 2,639,250 acres.

The locations of the refuges have been chosen with reference to the various kinds of game to be found, where both summer and winter range is provided and where administration will be easy. Doubtless some hunters will be inconvenienced by the establishment of these refuges in localities where they have been accustomed to hunt, but most of them realize the necessity for such conservation measures and will gladly seek other hunting grounds. The following list gives the location and area of each of the proposed refuges:

PROHIBITION OF THE SALE OF TROUT NECESSARY.

Most of the states have become convinced that commercialization means extermination, and therefore have passed laws prohibiting the sale of all game. California many years ago was driven to prohibit the sale of deer, quail and shore birds. Now necessity demands that the sale of trout be stopped.

The incentive to gain the dollar has forced the market fishermen at Lake Tahoe to deplete the supply of fish in that lake. Nor is that the only lake threatened, for the facility with which markets can be reached by means of automobiles makes the stripping of other mountain lakes more than a possibility. The angling afforded in mountain lakes should act as a lure to take people afield, where healthful recreation is possible. This can only be accomplished when undiminished sport can be obtained.

The market fishermen of Lake Tahoe are making a strong fight to defeat the nonsale of trout bill, which is before the legislature. The bill is a sane conservation measure and will deprive no one of his livelihood. These fishermen can earn a better day's wage by taking out anglers than by the sale of ten pounds of trout, a day's limit.

The sale of trout allows the millionaire to obtain these fish for his table, but the poor man can not afford such a luxury. Stop the sale and the trout of Tahoe and other mountain lakes will be

County	Location	Acres
San Diego	In vicinity of Laguna Mountain	51,840
Riverside	In vicinity of Sheep Mountain	69,120
Ventura	Near headwaters Sespe River	125,440
Santa Barbara	Near Upper Sisquoc River	39,680
Tulare and Kern	Where Kern River crosses county line	57,600
Fresno	Near forks of Kings River	32,400
Amador	In vicinity of Panther Creek	57,600
El Dorado	Near headwaters American River	64,000
Plumas	Near headwaters Feather River	31,000
Tehama	In vicinity of Mill Creek	34,400
Lassen	On northwest side Eagle Lake	47,580
Modoc	In vicinity of Pine Creek	47,360
Modoc	In vicinity of Mowitz Butte	57,600
Shasta	Near north side of county east of McCloud River	69,000
Siskiyou	On north side Klamath River	9,990
Mendocino and Lake	Near Hull Mountain	37,000
Monterey	At head of Arroyo Seco	69,000
Total number of acres		880,180

for all alike. Anyone who wishes may enjoy the angling which these lakes afford, and fishing conditions will improve rather than deteriorate, as they have the past few years.

THE SPEARING OF STEELHEAD TROUT.

The most fundamental law of fish and game conservation is the one which provides that fish and game shall be allowed to breed undisturbed. We demand that all of our best game birds and mammals be given the best of protection during the breeding season and the closed season is always made to conform to the breeding season. In spite of this situation there are a number of people in the coast counties who are demanding the right to spear steelhead trout while they are on the spawning grounds. Furthermore, they are demanding the right to fish with a gaff, thus increasing many times the destructive forces already at work. Just as people are seeking a better grade of sportsmanship by advocating the use of a fly rather than bait in capturing fish, just so the tendency should be towards the elimination of such a destructive instrument as a gaff hook. This instrument can be carried to a pool where large spawning fish are abundant and by feeling around with the end of the hook the whole pool can be stripped of its fish. This is seldom possible when a spear is used. The law as it now stands provides that the people of the counties mentioned can capture two fish a day between December 15 and February 15, a sufficient number for use as food. The demand for a more liberal law as regards the method of capture is in reality a demand for a larger catch at the time of year when fish should have total protection. Every spawning fish killed means a direct loss of thousands of young fish. Furthermore, it is always the largest and therefore the heaviest spawners that are taken by means of a spear or gaff.

Fig. 27. Wild sage hens feeding near Straw, Modoc County. Photograph by G. Courtright.

As far as possible each section of the country should be allowed to utilize its wild life resources, but destruction of such resources can not be permitted.

It will be necessary, ultimately, to prohibit the destruction of fish during the spawning season. The move to take a larger toll of the spawning steelhead throughout the state is therefore directly contrary to natural law and a depletion of the streams is sure to follow.

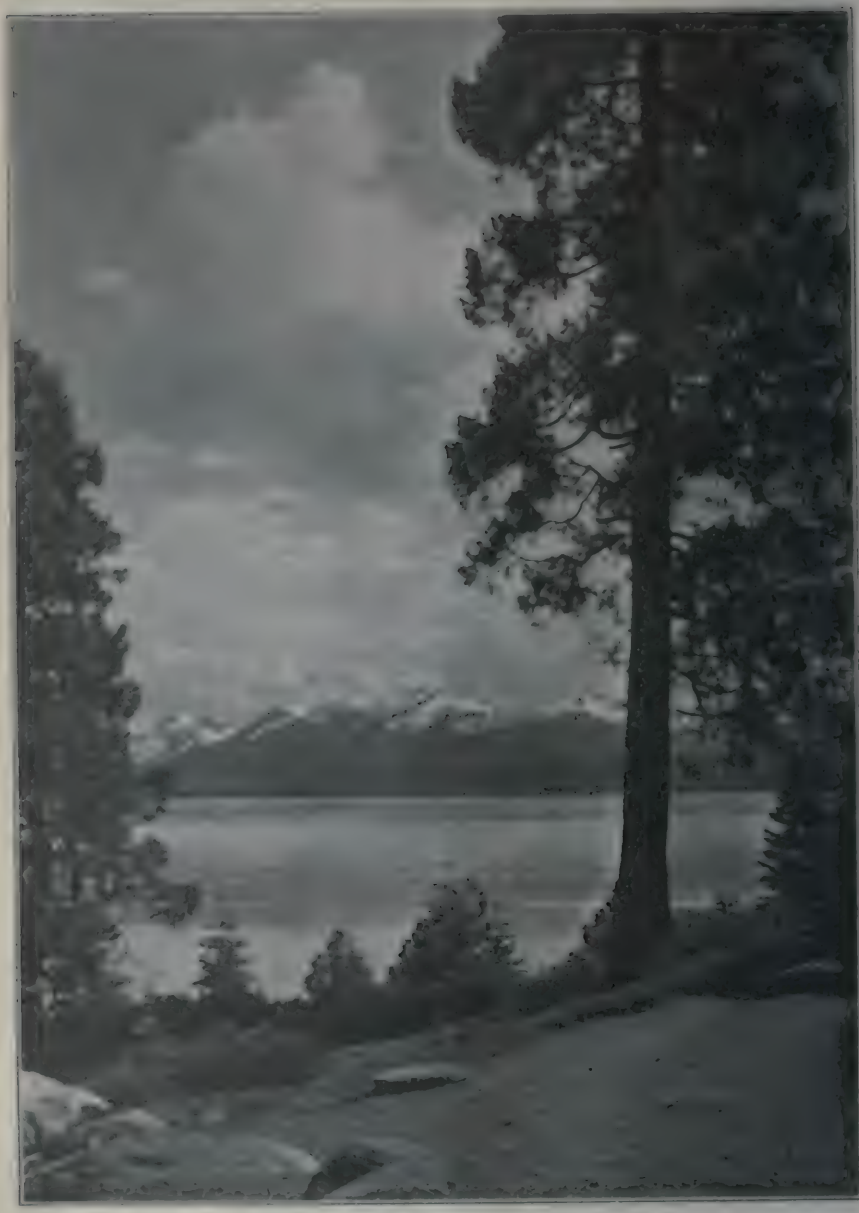

Fig. 28. Lake Tahoe, home of the famous Tahoe trout. Photograph by H. A. Parker.

POWER DEVELOPMENT IN THE HIGH SIERRAS BENEFITS FISHING CONDITIONS.

In most instances the works of man have a detrimental effect on wild life. That bettered fishing conditions should go hand with hydro-electric power development in the high Sierras appears unusual. Such is the case, however, as can be seen from Mr. Ferguson's article, which appears on page 55 of this number. Moreover there are other good things which follow such development. Scenic beauties are improved by the addition of large bodies of water, and good roads make out of the way places accessible. As everyone knows development of this kind means a lessened supply of game birds and animals. It is interesting to note, therefore, that in many cases the opposite is true with fish and that, as a rule, fishing conditions are bettered rather than impaired.

THE TUOLUMNE FISH AND GAME PROTECTIVE ASSOCIATION.

We have often wondered why so few effective game protective associations exist in California. In eastern states practically every man that carries a gun is identified with one local fish and game protective association. Can it be that organizations of this type only spring up where fish and game have been nearly exterminated? Surely there is work for such organizations in states well stocked with fish and game. In fact, the object of such a society should be centered on conserving a permanent supply of fish and game rather than on the bringing back of wasted wild life resources.

We are glad to announce the formation of the Tuolumne Fish and Game Protective Association. The professed object of this organization are the protection and perpetuation of fish and game. To gain this purpose the members will cooperate with all game wardens by reporting violations and will also willingly appear as witnesses at trials.

In a state such as California there should be hundreds of such organizations instead of less than a dozen. What a potential power lies undeveloped! How much it would mean for fish and game conservation if there were many fish and game protective associations in our state all banded together in one great organization, not with a selfish or local purpose, but with a single interest—fish and game conservation.

HEADLIGHT GLARE CAUSES DEATH OF DEER.

Orders recently were issued by the Southern Pacific to its engineers to save the lives of deer seen on the tracks at night by momentarily putting out the headlights of locomotives.

While deer are migrating from higher to lower altitudes they frequently use the railroad tracks for the journey, and if traveling at night are dazed by the headlights of approaching locomotives. Southern Pacific trains, especially in the Siskiyou mountains and in the Sierras, have struck and killed as many as a dozen deer in a single month. On looking into the glare of the headlights, the animals are confused and unable to get out of the way. On darkening the light, even for an instant, they jump to safety.

On receipt of a statement of conditions from the Fish and Game Commission orders were issued by President William Sproule and General Manager W. R. Scott that headlights are to be momentarily extinguished when deer are seen on the track, except in instances where the train is approaching a public crossing, or in any other instance where the public will be jeopardized.

A CREED OF WILD-LIFE CONSERVATION.

[The following interesting creed, to which we largely subscribe, appeared several years ago in *Outdoor World and Recreation.*]

1. The protection of all useful wild creatures and preservation of nature's resources from wanton destruction that the natural beauties of the great outdoor world may not be rendered wastes and barrens, but be preserved for the use and recreation of us and those who come after us.

2. Such restrictions upon the sale of all game or food birds as may be necessary to preserve a continental supply of such birds and prevent their extermination and secure the most practical results from their economic value.

3. A uniform system of closed season throughout the continent that will prevent the killing of all useful birds from the

first day of February in each year to the first day of September following, and such extension of special closed season as may be necessary to prevent extermination of particular species of birds.

4. Such restrictions upon the use of all sporting arms of whatever type as may be necessary to preserve a normal breeding supply of useful wild creatures.

5. A transcontinental system of game refuges and forest reserves.

6. A wise system of practical laws encouraging the breeding and sale of propagated game and food birds.

THE ENGLISH SPARROW CAMPAIGN IN REDLANDS.

The October number of CALIFORNIA FISH AND GAME made some mention of the English sparrow campaign being conducted by the city of Redlands, and a brief summary of the results of that campaign to date is therefore timely. I am indebted to Mr. I. Cushman Gray of the city clerk's office for most of the data given as evidenced by the city records.

For several years past English sparrows have apparently been gaining ground in Redlands, until last winter and spring they were becoming an alarmingly conspicuous element of what might be termed "the downtown fauna." They have been reported a number of times from the Heights and other outlying parts of the city, but I myself have seen them only in the business district and the thickly settled region immediately environing it. In my yard, a little over two miles from the heart of town, I have never seen an English sparrow during the most constant watch, though a number of the native sparrows are common enough. Downtown it has been otherwise, and an increasing feeling that municipal action was the only way to combat successfully the menace of the increasing numbers of the invading sparrow finally culminated in a resolution of the board of trustees authorizing a war of extermination. This was duly begun on July 19th. The work was placed under the direct supervision of the city marshal, and shooting was the general method employed. Several hunters were engaged in the work at a compensation paid by the city, but dependent upon the number of birds killed. This was at the rate of five cents per head until the "game" proved so scarce or hard to find that it became necessary to raise the bounty to ten cents in order to insure the completion of the work. The higher bounty has been in effect since the 6th of September. Up to the time of writing (the last of November), a total of 4,265 birds have been killed. The catch is apportioned through the respective months as follows:

July 19 to August 20	1,528
September 1 to 30	1,841
October 1 to 31	862
November	34
Total	4,265

The cost to the city is represented by the following figures:

1,729 birds at 5 cents each	$86 45
2,536 birds at 10 cents each	253 60
Total cost to city	$340 05

Judging from the reports which have come in to them, the city officials believe that the campaign has been quite thorough. But few of the sparrows are now seen in the city, and these are said to be mostly on the outskirts, though I am aware of one colony and have been told of another close to town, which are not yet entirely stamped out. Therefore the campaign is held to be practically closed.

Probably the most difficult problem connected with the execution of an anti-sparrow campaign is that of the successful eradication of the European bird without too great damage to our many useful species of native sparrows, the presence of which is so indispensable to the agriculturist, yet which so frequently suffer confusion at the hands of the layman with their undesirable foreign cousins. Concerning the success with which this difficulty was surmounted in the present instance, opinions vary. Without attempting to take a stand either way, it may be that a brief reference to the diverging views may be of value to those who are planning or have in hand a similar campaign elsewhere. The men in charge of the campaign claim that less than 1 per cent of the total birds killed were of species other than the one sought. On the other hand several citizens not connected with the hunt itself, but interested in the preservation of valuable birds equally with the destruc-

tion of noxious ones, maintain that the slaughter was less discriminating and that the English sparrows did well to comprise half of those killed during the war. According to this view, the major percentage were linnets, white-crowned sparrows, and chipping sparrows. The hunters did not encounter much difficulty in identifying the male English sparrows, but the females are much harder to tell at a little distance from other birds. Is it not the general experience that the only safe way to deal with this problem is to place the entire campaign in the hands of one who not only knows the identity and relative value of bird species, but who is thoroughly familiar with their habits and appearance in the field as well? This seems to me a vital point, so important in the broader aspects of the whole problem as to justify any extra trouble or expense which in such a campaign is at all likely to be entailed. It should always be remembered that the principal reason we have to justify the slaughter of the English sparrow is that he is an enemy of our native birds. In attempting the restoration of the faunal equilibrium, we defeat our own chief end if we inadvertently destroy the wheat with the chaff.—STILLMAN I. BERRY.

THE HUNTING ACCIDENTS OF 1916.

Pursuant to the custom, begun last year, of recording hunting accidents, we give herewith a list of such accidents for the year 1916. The compilation has been made in the hope that many observing the results of the careless handling of guns, will use more caution in the future, and so lessen accidents of this sort. It should be noted that in spite of the fact that the list is a long one, many hunting accidents occurring last year have gone unrecorded because of the lack of definite information regarding them. Furthermore, automobile accidents in which hunters were concerned are omitted.

A comparison of the report with the one made last year shows a pleasing decrease in fatal accidents in which a man was taken for game. On the other hand, there is a decided increase in the number of hunters injured or killed through the accidental discharge of a gun. Certainly, the report teaches that:

A gun must never be pulled out of a boat or under a fence barrel first.

Fig. 29. Male and female English sparrow. This introduced bird not only destroys growing crops but drives away native beneficial birds. Control campaigns have been carried on in several cities. Courtesy National Geographic Magazine.

HUNTING ACCIDENTS.

Killed.

Name	Shot by	Date	Locality	How shot
Sydney Harrington	Antone Pedemonti	Aug. 3, 1916	Salinas	While hunting deer
Thomas E. Patterson	Fred Hoffman*	Sept. 27, 1916	Big Pine, Tehachy Co.	Mistaken for deer
Chas. A. Ludkins	Alex Adams	Feb. —, 1916	Elsa Grove	

*Committed suicide afterwards.

Wounded.

	Companion	Sept. 21, 1916	Mt. Meadows, Lassen Co.	While shooting at deer
Joe Healy (16 years)		Nov. —, 1916	Sacramento	On hunting expedition
Fletcher Pattison	Companion	Oct. 18, 1916	San Diego	While trying to shoot ducks
Julius Pullen (11 years)		Aug. 24, 1916	Eureka	Taken for deer
Carl Morabe	Ed Sbenior	Sept. —, 1916	Stone Lake	
Frank Warnekros	Companion	Sept. —, 1916	Fresno	Shooting doves
Wm. Fowler	Companion	Dec. 12, 1916	Newhall	Hunting quail
Clarence Viethees (16 yrs.)	George Hogan	July 10, 1916	Petaluma	Hunting quail
Robert Davis	Companion	Oct. —, 1916	Yolo County	Hunting quail
Wm. Hardester (17 years)	Companion	April 24, 1916	Lake County	Mistaken for game
H. C. Hinckley	Companion	Nov. 19, 1916	Yolo County	Hunting ducks
Louis Unselt	Two hunters	Aug. 3, 1916	Ukiah	Mistaken for deer
Justin Bordenave	Harry Nico	Dec. 10, 1916	Oakland	Shooting ducks
John Crumley	Unknown hunter	Aug. 30, 1916	Salinas	Working in woods
Carl Armstrong	Willie Collier	Oct. 26, 1916	Oakland	Hunting ducks

Shot by Accidentally Discharged Gun.

Name	Locality	How shot
Scally	Napa	Crawling through fence. Gun shot off [illegible]
Ray Baugh	Monterey	Shot in arm while hunting ducks.
Frank Kelton	Monterey	Shot in leg while hunting deer.
Thomas Jensen	Salinas	Shot while hunting geese
Lawrence Beevers	Salinas	Shot in thumb while hunting quail
William Irvine	Salinas	Shot in head while hunting ducks
——— Austin	Broderick	Shot in hand while hunting ducks
Henry Leopold	El Cajon	Killed by discharge of gun being taken from auto.
Leslie Spoolfield	Angels Camp	Shot in thigh while hunting; died of blood poisoning.
Tony Navas	Murphys	Shot in foot.
Leonard Kelly	Marin County	Shot in head pulling gun through fence.
Harold McKay Noble	Lassen	Killed while creeping up on ducks
H. C. Hinckley	Knights Landing	Shot in eye.
Albert J. Richards (19 years)	Cazadero	Shot in leg. Died.
Walter E. Lander (16 years)	Guerneville	Shot in head. Died.
Joseph Beaumont (15 years)	Solano County	Shot in chest. Died.
Albert Hopper (18 years)	Sacramento	Shot in groin. Died.
Russell Martin (18 years)	Skaggs Springs	Shot in foot.
Bernard Schoenings	Petaluma	Shot in legs.
Jack Dron (14 years)	Sacramento	Shot in foot.
Albert Isenstein (19 years)	Santa Rosa	Shot in leg. Died from loss of blood
Jules Batka	Chico	Shot in arm on shooting.
Frank Bachelle	Milpitas, Tuolumne Co.	Companion tripped and fell, discharging gun.
John Kelly (18 years)	Las Gallinas	Shot in arm while pulling gun from boat
Chas. A. Sullivan	Cupertino	Shot in arm.
Sherwood Moran	Stockton	Shot in hand.
Clarence Smith (16 years)	Imperial	Shot in hand while hunting ducks.
Ralph Thomson	Salinas	Shot in face while crawling through barbed wire fence.
Leland Paul	Pacific Grove	Shot in hand when attempting to remove mud from gun.
Wm. R. Lansdale	Anderson	Shot in left leg.
Paul J. Maguire	Los Angeles	Fatally shot by accidental discharge [illegible]

MAPS FOR YOUR SUMMER VACATION.

The government wisely provides help for those who seek it. The agriculturist is furnished with information as to methods of growing larger and better crops. The mariner is furnished with information as to weather conditions. Even the summer vacationist has at his command information on the locality chosen for a summer camp. The quadrangle maps issued by the United States Geological Survey are almost indispensable to the person who desires information on the contour of the country and the location of points of interest. By the use of these maps the average camper can tell with fair certainty just where he is. These maps are available at cost price and can be obtained either in Washington or in nearly all the large cities. Most of California has been thus mapped, but there are many other states that are not so fortunate. The present movement to expedite the completion of the topographical maps of the United States is therefore commendable. Those sufficiently interested should bring pressure to bear upon the authorities in Washington, D. C., that more of these important maps may be made available to the people.

Attention is called also to the excellent recreation maps furnished by the United States Forest Service. These maps give dependable guidance regarding trails, roads, streams, settlements, etc., of each national forest, together with a description of the resources of the forest.

SALISBURY FISH AND GAME FILMS NOW AVAILABLE.

The Fish and Game Commission is now in possession of a set of the famous Salisbury Fish and Game Pictures. The six thousand feet of film depicts the fish cultural work of the commission, showing the operations from the taking of the eggs to the planting of the young fish in the streams, illustrates the life history of many birds and animals and vividly portrays many of the fundamental aspects of wild life conservation. Schools, sportsmen's clubs and other organizations desiring to have these films shown under their auspices should write the Bureau of Education, Publicity, and Research, Museum of Vertebrate Zoology, Berkeley, California.

NATURE STUDY IN LOS ANGELES PUBLIC SCHOOLS.

Under the direction of Dr. Charles Lincoln Edwards, nature study has become an important part of the curriculum of the Los Angeles public schools. The whole system of nature study is built up on the theory that children should not be told the things which they can find out for themselves and that nature play, rather than nature study, is the key to a wonderful fairyland of which the child is a part. Without formal lessons and examinations and stimulated only by the spirit of play, the child may get an understanding of the other animals that live in the world about him.

According to Dr. Edwards ("Nature Play" in *Popular Science Monthly*, April, 1914): "Nature play is the true basis for all knowledge. Through this dominant interest the child is led to know of the living things about him. Not merely are the facts of nature important, but much more valuable is the fascinating story of how and why these facts came to be. It is of much import to learn that the animals which bear scales and those covered with feathers, or fur, are all wearing similar clothing, but of the different fashions best suited to their needs. It is still more significant to realize that fundamentally the minds of all animals are as allied as are their digestive and respiratory systems. The great end of nature play for the child is not simply to learn of the rest of nature, but better to know himself as a part of nature."

In the Los Angeles system the field trip is given rightly an important place. Knowledge of the birds and animals about us is acquired best through a first-hand acquaintance rather than through the medium of a picture or a written description. The whole educational system should be more closely associated with natural objects seen out of doors. It is to be hoped that many other cities of the state will inaugurate nature study field trips. When nature study is more widely taught in our public schools the principles of wild life conservation will become so imbedded in future generations that there will be no lack of champions of the conservation cause.

FUR FARMING IN BRITISH COLUMBIA.

That fur farming is becoming a well established industry in British Columbia is evidenced by the following, which appeared in the eleventh report of the provincial game warden, 1915:

The reports received from the fox-farming companies that are operating in this province have been extremely satisfactory, some of the operators having gone to a great deal of trouble in giving a lot of information as to their methods. A most comprehensive report of the operations of the companies at Telegraph Creek was also received from the government agent of that district. Great pains were evidently taken in getting up this report, and it is most valuable, as it gave most detailed information on everything that could possibly be of interest. It is hoped that before long it will be possible to embody this and the other reports into an article that will be of use to those who are either engaged or about to engage in the industry.

Until this year no records were received at this office of any foxes bred in captivity, but this year eleven different farms have sent in such records. In all, fifty-six foxes were bred this year, and, as far as is known, these are all still alive. In addition, one or two litters of red foxes were born, but destroyed as not being worth raising. The company operating at Bella Coola reports that several litters were born, but that heavy blasting on a road close to the farm caused the parent foxes to destroy all their young. The Telegraph Creek companies had no success at all; most pups born were killed by their parents; one litter that might have been raised was destroyed, as they were only of the red variety.

The most successful operators were those located at Atlin, Pouce Coupe, and Francois Lake.

There was a fairly heavy loss of foxes during the year; some escaped from the pens, others got killed in fighting, but the principal loss was through "worms." All such losses can easily be done away with if the foxes are in the hands of a man who has requisite knowledge of his work.

The recent collapse of the boom in fox-farm shares will eventually result in just as much good as the collapse of the real estate boom. The industry will now come down to a proper business footing. Prices of live foxes having fallen, nothing like the capital hitherto required will be necessary, and many people will go into it on a small basis who were not able to do so before, and it is the small operators that are likely to meet with the most success.

Even with the price of fox pelts 50 per cent lower than it is at present, a good profit could be made in breeding foxes, as it costs very little more to raise foxes on a small scale than it does to raise small dogs. There is no reason why all the farmers' sons should not have a pair or two as pets, in the same way that boys in England keep rabbits, pigeons, etc., and often make good profits. It is likely that far more money would be brought into the country in this way than by a few big companies.

Every encouragement should therefore be given to those living in the country to make a start. It would be best to begin with red foxes, which are easily obtained and of little value.

THE CONSERVATION OF NATIVE FAUNA.

The October number of *The Scientific Monthly* contains an interesting article entitled "The conservation of native fauna," by Walter P. Taylor of the Museum of Vertebrate Zoology, University of California.

Dr. Taylor traces the history of the gradual reduction in numbers of all of the larger game mammals of California from the time when, in the early history of this state, they were abundant, down to their present depleted state, which in at least two cases, the grizzly bear and the sea elephant, amounts to total extinction.

The mammals whose histories are given are the otter, the beaver, the sea elephant, the sea otter, the deer, both black-tailed and mule, the Roosevelt and valley elk, the mountain and desert sheep, the prong-horned antelope, the black bear and the six different species of grizzly bear.

Some very interesting data are given regarding the traffic in furs in the early history of California, when large numbers of skins were exported. The increased scarcity of sea otter skins is indicated by the increase of price, which in 1880 was $80 and in 1910 was $1,703.33. Elk and deer were so abundant in early days that three thousand were exported from San Francisco in 1842, at prices ranging from fifty cents to a dollar per head.

The grizzly bear, once so distinctly a part of California as to suggest the name "Bear State," and to become the totem on the first flag of California, has disappeared completely. The last known survivor of the largest species, found in southern California, was killed in the Santa Ana Mountains in August, 1900 or 1901.

The concluding paragraphs of Dr. Taylor's paper point out the fact that not

only California, but the whole world, has been wasteful of its wild life resources for the last fifty years, and that it is vitally important that the people everywhere understand the urgent necessity for conservation measures even more rigid than those already in force, in order that California may regain, in part, what her people have been so prodigally wasting for so many years. On the biologist is laid the role of leadership in the campaign for the preservation of native fauna and on him must blame for ignorant and destructive popular action, legislative or otherwise, inevitably fall.—PHILIP JANNEY.

THE NATURAL ENEMIES OF BIRDS.

In order to exhibit the utility of native natural enemies of birds and to show the misfortunes that might follow their extermination, as well as to set forth the conditions under which they might need restraint, and to point out those exceptions that are believed to be most destructive, a bulletin has been issued by the State Board of Agriculture of Massachusetts. This paper, in the Economic Biology series, bulletin No. 3, is entitled "The natural enemies of birds," and is by Edward Howe Forbush, State Ornithologist. Fifty-eight pages are utilized in treating of the natural enemies of animals, in pointing out the useful and the harmful species and the means to be taken to control those which are harmful. This is followed by more detailed accounts of the introduction of domestic enemies, such as the cat and dog, rat and such feral enemies as foxes, minks, weasels, skunks, shrikes, bluejays, hawks and owls, snakes, frogs and insects. The bulletin is illustrated with six plates and a number of figures showing the comparative amounts of the different food items taken by different natural enemies.

As controllers of life, natural enemies have an important place in the economy of nature. It is well known to naturalists that in a state of nature the natural enemies of any species are as essential to its welfare as are food, water, air and sunlight. Unthinking people are slow to realize this, as they see only the apparent harm done by the so-called rapacious creatures, and fail to observe and reason far enough to perceive the benefits that such creatures confer upon the species on which they prey.

Insect-eating, fish-eating and flesh-eating animals are essential in the great scheme of nature, as they serve to check the increase and regulate the numbers of other species, which in turn, when so regulated, tend to perform a similar office for vegetation. Thus these predatory creatures may be regarded among the chief controllers of life upon this planet. Man, the savage, of course must be included among them, and civilized man, if guided by reason and wisdom rather than greed or folly, may exercise a beneficial control over many of the lower animals.

Among the menaces pointed out in the methods of controlling natural enemies is the introduction of foreign species which tend to destroy the balance of nature, and the bounty system, which, with few exceptions, has proved a failure. Bounty laws tend to encourage the use of guns in the fields at all seasons of the year and they continually encourage fraud. As evidence of the fraud which is sure to appear Mr. Forbush quotes Dr. Jos. Kalbfus, secretary of the game commission of Pennsylvania, as saying that many men are willing to commit perjury for a dollar. One man claimed to have killed 102 goshawks in four days in July, when this bird is only found in Pennsylvania in autumn, winter or early spring. Many frauds such as this have been perpetrated in the state of Pennsylvania since the bounty system took effect.

In recapitulating, it may be said that this bulletin shows that (1) natural enemies of birds are necessary and desirable, as they tend to maintain within proper bounds the numbers of the species on which they prey; (2) organized attempts to increase the numbers of birds over large areas by destroying indiscriminately all natural enemies are undesirable; (3) under certain circumstances enemies which have been able to adapt themselves to man and his works and have become unduly numerous may require reduction in numbers; (4) individuals of useful species which may become particularly destructive should be eliminated; (5) self-interest on the part of the people most concerned eventually will bring about such reduction of predatory animals as is needed without the stimulus

of bounty laws, which in most cases are pernicious and which if enacted at all should be directed only against the larger predatory animals or those which are dangerous to human life or exceedingly destructive to domestic animals or crops.

LAWS RELATING TO FUR-BEARING ANIMALS, 1916.

Pursuant to custom, started several years ago, the Bureau of Biological Survey has issued a bulletin entitled "Laws relating to fur-bearing animals, 1916," which has been issued as Farmers Bulletin 783. This report is a summary of the laws in the United States and Canada relating to trapping, protection, propagation and bounties of fur-bearing animals.

The introduction is of particular interest: "The value of the raw fur production of the United States and Canada has grown enormously in spite of the steadily diminishing supply of animals that furnish the finer pelts. In 1915 trappers of North America earned by their industry probably not less than $20,000,000, a remarkable sum when it is remembered that exports of raw furs were only about half the normal proportions. Conditions of the trapping industry have been greatly improved in recent years by legislation protecting fur animals in much of the territory where the business is important. As with game laws, each year brings changes in the trapping regulations, and it becomes important that the rights and privileges of trappers, as well as the limitations placed on their calling, be made plain. The present bulletin is designed for this purpose. It gives a brief review of changes made by legislative enactments of the past year, a summary of trapping regulations now in force, followed by short statements of the open seasons for taking furs, provisions relating to propagation of fur animals, and bounties offered for the destruction of predatory species, or those considered harmful. These are given by states and provinces, arranged in alphabetic order."

The larger part of the bulletin is devoted, therefore, to a systematic treatment of the laws in each state, followed by a summary of fur protection, giving under the different species of fur-bearing mammals a table showing the length in days of open season for trapping various fur animals.

That California is lagging behind as regards protection for fur bearers is evident by the following facts brought out in the bulletin: The mink has a closed season in Alaska, in twenty-four states and in nearly all of Canada; the skunk has a closed season in eighteen states; the raccoon in nineteen states; and the fox in eleven states. Not one of these fur-bearers is given protection in California.

The bear appears to be given poor protection everywhere. Only four states now have a closed season and a few of the states either forbid trapping or regulate it. In giving protection to bears California could be one of the leaders and it is hoped that this opportunity will not pass unheeded.

The bulletin above reviewed comes at an opportune time, for it will give much necessary data in connection with the attempt being made to give fur-bearers in this state the protection which they need during this session of the legislature.

DEATH CLAIMS TWO NOTED SCIENTISTS.

During the past year death has claimed two noted ornithologists. Professor Wells W. Cooke, in charge of the migration investigations of the United States Biological Survey, died at his home in Washington, D. C., March 30, 1916, from acute pneumonia. No man in the United States knew more about the migration of North American birds. The notes of hundreds of observers throughout the United States were annually compiled and the data thus obtained form a basis for many valuable publications dealing with bird migration. The distribution and migration of different groups of birds were treated in separate bulletins. Consequently we find such titles as "Distribution and migration of North American shore birds" (Biol. Surv. Bull. 35), "Distribution and migration of North American herons and allies" (Biol. Surv. Bull. 45), "Distribution and migration of North American rails and their allies" (Bull. U. S. Dept. Agric. 128). The most important general paper, one which sums up the present day knowledge of the migration of North American birds, treating of such subjects as causes of

migration, records of migration and speed of migration, is the one entitled "Bird migration" (U. S. Dept. Agric. Bull. 185). One of Professor Cooke's published articles entitled "Our greatest travelers" (Nat. Geog. Mag., 1911, 346-365), attracted wide attention and is one of his best known publications.

In the death of Professor Cooke those have lost the man foremost in research on migration. What younger worker will be able to continue the work so ably carried on by Professor Cooke still remains to interested in the birds of North America be seen.

Another ornithologist more closely related to work in California died at his home, Branchville, Maryland, October 1, 1916. This was Professor Foster E. L. Beal, assistant, United States Biological Survey, a man noted for his work in economic ornithology. Our first definite information on the foods of birds in California was the result of the work of Professor Beal, who for several years studied the relation of birds to fruit-growing in California.

The economic work of Mr. Beal came at a time when any esthetic or economic value that a bird might have was entirely overshadowed by depredations made more obvious by the conditions existing in a new country. The bringing under cultivation of large areas together with the consequent destruction of native food plants forces the birds to turn their attention to the substituted field crops and exotic trees and shrubs. The comparatively small amounts of this new food supply, which supplants the native one, results in more apparent destruction of cultivated crops. The dry summers form another factor in California conditions, for juicy fruits prove an acceptable substitute for water. With no regard for inherent values or protective measures, farmers formerly resorted to the gun and harmful and beneficial birds alike met the same fate. This was the situation when the bulletins on the food habits of California birds appeared.

The evidence brought forth in the bulletin "Birds of California in relation to the fruit industry," published in two parts (U. S. Dept. Agric. Bur. Biol. Surv. Bull. 30 and 34), so clearly showed the economic value of California birds that there was a noticeable change in the attitude of the ranchers of the state. Many other bulletins have shown the dollars and cents value of California birds and to Mr. Beal must be given credit for being the first one to show the economic relations of California birds and to develop interest in the protection of the insectivorous birds beneficial to agriculture. For twenty-five years economic ornithology has been enriched by the investigations of this tireless worker who laid the foundations of economic ornithology in California.

HATCHERY NOTES.

W. H. Shebley, Editor.

MOUNT SHASTA HATCHERY.

After the completion of the distribution of trout fry from the different hatcheries of the state during the fall of 1916, the stations were put in shape for the coming season's operations.

This work was completed at Mount Shasta Hatchery during the month of December. During the month of November the first eggs of the eastern brook and Loch Leven trout were taken from the adult fish in the ponds. Operations were continued throughout the month of December and approximately 1,500,000 eggs of each variety of trout were secured. About 150,000 eastern brook eggs were also received at Mount Shasta Hatchery from the Marlette-Carson operations in the state of Nevada.

Six million quinnat salmon eggs were shipped to Mount Shasta Hatchery from the United States Bureau of Fisheries stations on Battle Creek and Klamath River. These eggs hatched out during the month of January and the fore part of February. They have been given careful attention and the oldest of the fry have now reached the swimming stage. When they have been reared to the proper age, a portion of the fry will be returned to the Klamath River, plants made in the upper reaches of the Sacramento River

tributary streams in the vicinity of Sisson, and the remainder will be transferred to the large rearing ponds and lakes of the Mount Shasta Hatchery. Those retained in the lakes and rearing ponds will be fed during the spring and summer months and liberated in the Sacramento and Klamath rivers after the first rains in the fall, when the condition of the streams is most favorable for their journey to the ocean.

Additional facilities for the rearing of quinnat salmon at Mount Shasta Hatchery are being provided. The Commission has leased from the Sisson Tavern Company the large artificial lake situated a short distance south of Mount Shasta Hatchery grounds, known as Sisson Lake. With the acquisition of this large body of water for a rearing pond for the quinnat salmon, this important branch of the Mount Shasta Hatchery operations will be greatly facilitated, as it doubles the capacity of the salmon rearing ponds.

FORT SEWARD HATCHERY.

A half million quinnat salmon eggs were hatched at Fort Seward Hatchery during the latter part of January. Previous to the receipt of this shipment of eggs, Fort Seward Hatchery had been fitted up for fishcultural operations for the season of 1917. The construction work commenced during September of last year, and the repairs to the hatching equipment were completed during the fore part of December. The salmon eggs are all hatched out and the fish are in excellent condition. As soon as the fish have reached the free swimming stage, they will be distributed in Mad and Eel rivers, Humboldt County.

As soon as steelhead trout eggs are ready for shipment from the eyeing stations, an ample supply will be shipped to Fort Seward Hatchery for stocking the streams of Humboldt and Mendocino counties.

MOUNT SHASTA AUXILIARY STATIONS.

Owing to the extreme drought throughout the state during December and January, the egg collecting operations were delayed until late in February. On February 1 a crew was sent to the stations at Bogus and Camp creeks, on the Klamath River. These two plants

Fig. 30. Hatchery A and breeding ponds at Mt. Shasta Hatchery. Photograph by G. H. Lambson.

were put in shape for the season's operations, but it was not until the latter part of the month that the large Klamath River rainbow trout commenced to run. The first spawning of the season was on February 17, when 120,000 eggs of this species of trout were taken. The storms throughout the northern part of the state increased the run of fish into the tributary streams of the Klamath River, where our egg-collecting stations are located, and the take of rainbow eggs now promises to be very good.

operations and very little work was necessary in the way of improvement. The hatching troughs were repainted, and a few minor repairs made to the building and hatching parapherualia. The first steelhead trout eggs were received from the Scott Creek Station on February 20.

SCOTT CREEK STATION.

As in the streams of the northern part of the state, the run of fish in Scott Creek was delayed over a month, owing to the extreme drought. The steelhead trout

Fig. 31. Steelhead fishing on the Eel River.

ALMANOR HATCHERY.

On March 1 a crew of men will be sent to Lake Almanor, Plumas County, to open up the Almanor Hatchery, and Domingo Springs egg-collecting station. With the improvement in the Almanor Hatchery buildings, traps, etc., and the addition of the egg-collecting station at Domingo Springs, excellent results should be obtained from the fishcultural operations in Plumas County this season.

BROOKDALE HATCHERY.

Under the terms of the agreement entered into between the board of supervisors of Santa Cruz County and the California Fish and Game Commission, the Brookdale Hatchery was taken over by the commission on January 1. The hatchery was in excellent condition for

usually commence to run during the month of January, but this season it was not until February 20 that the first lot of eggs was taken. It was feared that our take of steelhead eggs this season would be very light; but with the heavy storms of the past ten days we are almost assured of at least an average take of eggs at Scott Creek Station.

SNOW MOUNTAIN STATION.

Whereas large numbers of steelhead trout are reported in the Eel River a short distance below the Snow Mountain dam, but very few fish have been taken in the traps at this station. It is probable, however, that with the recent storms the fish will soon commence to run, and our season's take will be satisfactory.

TAHOE HATCHERIES.

Preparations are now being made to open the Tahoe hatcheries at the usual time this season. Arrangements are under way to open the egg-collection station at Tallac on March 18.

MOUNT WHITNEY HATCHERY.

On January 21 the construction of Mount Whitney Hatchery was completed by the Department of Engineering and the plant was turned over to representatives of the Fish and Game Commission.

Fig. 32. Mt. Whitney Hatchery as it appears completed.

Previous to our taking over the hatchery, we had ordered all necessary supplies for the construction of all fishcultural equipment used in the operation of the hatchery, as well as paint for painting the hatching troughs. Therefore, we were prepared to go right ahead with this work. A portion of the hatching troughs have now been painted, and work is being rushed on the baskets, trough covers, etc. The hatchery will be ready for operations in ample time for the carrying out of our plans for the work this spring and summer.

With the Mount Whitney Hatchery and the auxiliary station at Rae Lakes in operation, the work of stocking the streams of southern California and the San Joaquin Valley as far north as the Yosemite Valley, will be greatly facilitated.

BEAR VALLEY HATCHERY.

During the month of November all necessary repair and improvement work preliminary to the operation of the Bear Valley Hatchery during the season of 1917, as far as could be undertaken during the winter months, was completed. All that remains to be done when the crew reaches the station is to set up the hatching troughs and install the racks in the streams tributary to the lake. The water in Big Bear Valley Lake is at a high level this season, and our operations should be very successful. It was expected that our crew could make the trip into the lake about March 1, but the recent storms and heavy fall of snow will probably prevent their making the trip before the 10th or 15th of the month. However, this slight delay should not interfere greatly with the prosecution of the work of egg collecting, as the fish do not start to run in great numbers before the middle or latter part of March.

UKIAH HATCHERY.

Ukiah Hatchery will be operated as usual this season. Steelhead trout eggs will be shipped to this hatchery from the Snow Mountain station, and the fry will be distributed in the streams of Lake, Mendocino and Sonoma counties. It is our intention to ship the first lot of eggs ready for shipment from Snow Mountain to Ukiah this season, in order that the distribution of the fish can be made as early in the summer as possible.

CONSERVATION IN OTHER STATES.

OREGON CONTEMPLATES INCREASE IN ANGLERS' LICENSE.

A number of the anglers of Oregon are advocating an increase in the price of angling licenses with the proviso that the additional fifty cents be set aside in a fund to be used exclusively in trout hatchery work. Whether the license will be raised from $1 to $1.50 will depend upon the extent to which anglers support the suggestion.

THIRTY FATAL HUNTING ACCIDENTS IN PENNSYLVANIA.

Thirty lives was the toll taken by the hunting season of 1916, although the total accidents were only 102, considerably less than the total accidents of 1915, of which twenty-nine resulted in fatalities. The decrease in the total number of accidents and the fact that no one was mistaken for game is accredited to widespread publicity against promiscuous shooting.—*Pennsylvania Sportsman January*, 1917, p. 15.

WANTED, BY NEW MEXICO SPORTSMEN.

1. An efficient nonpolitical *game warden*.

2. The passage of the Game Refuge Bill—with the *scalp of the Mondell Amendment* attached.

3. A law tacking the Federal Migratory Bird Law to the Canadian Treaty. Such a law will wipe out the last chance of the *spring shooters*.

4. A *federal* fish hatchery for New Mexico.

5. Nationwide action to wipe out the last trace of *market hunting*.

6. Amendments to the state law simplifying the seasons, bringing it into conformity with the Migratory Bird Law, and authorizing the governor to proclaim temporary local closed seasons on any species on any area at any time.—*The Pine Cone*, January, 1917.

UTAH BIRD SANCTUARY.

In an effort to save the rapidly disappearing wild bird life of the state, arrangements have been completed for the establishment of Utah's first bird sanctuary, to cover an area of 700 acres. The use of the land is given free virtually to the state by property owners of the big cottonwood district, about four miles east of Murray.

State Fish and Game Commissioner Chambers will place quail and pheasants on the land, and his deputies will sprinkle feed there when the heavy snows of winter make it difficult for the birds to find anything to eat.—*Blue-Bird*, December, 1916.

GAME WARDENS TO BE UNIFORMED.

The wardens of the Conservation Commission of New York are to wear uniforms hereafter. The orders have been given because the commission believes that a uniform as a means of identification is appreciated by the public.

That a game warden be easily identified by people is important, but there is danger that the wearing of a uniform will afford a ready identification to the violator. Most states have thus far avoided the uniform and have believed more largely in the "plain clothes man" as an effective game warden.

SIXTH NATIONAL CONSERVATION CONGRESS.

Among the resolutions passed by the Sixth National Conservation Congress, held in Washington, D. C., on May 4, 1916, were those favoring the Chamberlain-Hayden bill and the Federal Migratory Bird Law. The following recommendations in the interest of aquatic life were also made:

a. That the states prohibit the unnecessary polluting of public waters;

b. That the fisheries in interstate waters be regulated by uniform laws, with the consent of Congress, not to be changed by one state without the concurrence of the other states affected.

c. That increased attention be given to the cultivation of fish in ponds on farms;

d. That the states take such action as will prevent the destruction of fish life in connection with irrigation.—*Recreation*, August, 1916, p. 78.

MINNESOTA ATTEMPTS TO REAR PHEASANTS.

The Minnesota Game and Fish Department reports that progress is being made in the propagation of pheasants at the Big Island Game Farm, recently established. About 1,200 eggs were secured from the thirty-six ring-necked pheasant hens, and eggs were also secured from prairie chickens and quail. As has been the rule elsewhere, a considerable toll was taken by crows and owls, and poachers and trespassers caused some injury to nesting birds. All of the young birds reared will be available for distribution in game refuges only.

LIFE HISTORY NOTES.

MORE BANDED DUCKS TAKEN IN CALIFORNIA.

During the 1916 open season, as in years past, several ducks originally banded in Utah have been taken in California. Mr. Chris Krempel killed a banded green-winged teal at the Greenwing Gun Club in Orange County during December, 1916. A report from the United States Biological Survey stated that the bird had been released at Bear River, Utah. On December 16, A. J. Buckley killed a green-winged teal at Los Banos, Merced County, bearing a tag numbered 3889. This bird was banded at Bear River, Utah, September 11, 1916. Another duck, banded at the same place on October 3, was killed by Henry Schubelhut at Brito, Merced County. S. G. Davis killed another teal bearing the number 4138 at the same place during January.—H. C. Bryant.

THE WOLF-EEL TAKEN IN SAN FRANCISCO BAY.

A fine example of the curious and interesting fish, the wolf-eel, was taken in San Francisco Bay, off Angel Island, February 13, by John Peetz and Bert Lake. The wolf-eel is a long, slender fish, bearing a superficial resemblance to an eel, but in reality not at all related to the eel. Its head is strong, its mouth filled with very strong conical canine teeth, the roof of the mouth being filled with rows of coarse molars. The head is only about one-eleventh of the total length of the fish. The dorsal and anal fins are very long, each of about 250 rays. The fish reaches a length of five to eight feet, and was one of the first, if not the first, species to be described from San Francisco Bay.

The first naturalist to study the fishes of this region was Dr. William O. Ayres, a charter member of the California Academy of Sciences. In 1855 Dr. Ayres obtained a specimen of this fish, which he described in the first volume of the Proceedings of the Academy. The fish was not only a new species, but it represented a new genus as well (*Anarrichthys ocellatus*).

The wolf-eel feeds chiefly on sea-urchins, sand dollars and the like. Although not often used as food, probably on account of its rarity, as well as its repulsive appearance, its flesh would no doubt prove nutritious and palatable if served in attractive form.—Barton W. Evermann.

SEA OTTERS SEEN NEAR MONTEREY.

Two sea otters were seen basking in the sun in the kelp beds off Del Monte between Seaside and Del Monte wharf on October 22, 1916. They were apparently an old and young one, and the theory is that the old one came back to look for one of her young which was caught in a sea bass net last year.—P. H. Oyer.

WILD SWANS ABUNDANT.

Apparently there was a great increase in the numbers of wild swans (*Olor columbianus*) visiting this state this past winter, 1916-17. All of the gun clubs in the Suisun district report the presence of swans on the duck ponds. One of the members of the Cygnus Club stated:

"Before daylight the air was very still and cold. The musical trumpeting of the swans could be plainly heard. As the members of the various clubs wended their way to the blinds for the morning shooting these great birds rose from the ponds where they had been resting and feeding, and circled the marsh, filling the air with their beautiful notes. The wild swan's note is one of the most plaintive and musical of all known birds."

I was on the marsh the same morning and should judge there were several hundred birds in small flocks circling in the air.—M. Hall McAllister.

WHITE MALLARDS.

A white mallard duck, the only albino mallard reported during the past open season, was killed in December, 1916, near Live Oak, California, by Sam Lamme, keeper of the West Butte Country Club. The bird, a male, has been mounted and is on exhibition at the clubhouse. Newspaper publicity has uncovered the fact that another mounted specimen of an albino mallard is in the possession of Colonel J. W. Dorsey of San Francisco. Still another specimen, a female, taken at Gridley, Butte County, several years ago, is in the collection of the California Museum of Vertebrate Zoology.—H. C. BRYANT.

BIRDS LOSE THEIR WAY IN FOG.

During the early part of October several reports appeared in newspapers that numerous song birds alighted on ships far off the coast during heavy tule fogs. Most of the references to the kind of birds alighting on ships were couched in such generalities as: "hawks, blackbirds, sparrows and crows." Although we have attempted to secure more specific information the following facts only have been verified.

A large number of birds, of several different species, alighted on the Danish motor ship "Chile" when sixty miles off the Golden Gate, in October, 1916. One of the birds, obtained and held in captivity for a short time by Mrs. M. C. Terry, from a detailed description appears to have been a spurred towhee (*Pipilo maculatus*).

Dr. M. C. Terry, of the United States Public Health Service, saw a number of English sparrows and a warbler of some sort on the deck of the Norwegian steamship "San Joaquin," which docked on October 21, 1916. These birds were said to have come aboard the ship when it was off the lightship, about ten miles off "the heads." The pilot of the ship reported that blackbirds and a small owl also came on board.

On the same day the captain of the British steamer "Dunstan," sixteen days from Panama, reported that many different kinds of birds alighted on the ship from ten to twenty miles off shore. He estimated that as many as 200 birds were on the ship at one time. Some of them were quite tame and lit upon his arms and shoulders.

The above information, although lacking in scientific detail, still points to the fact that many land birds occur at some distance off shore, especially during heavy fogs. The taking of such a permanently resident species as the spurred towhee many miles off shore is of more than ordinary interest.—H. C. BRYANT.

ANTELOPE APPEAR IN NEW LOCALITY.

On September 9, 1916, I saw one antelope (*Antilocapra americana*) at Coon Camp Flat, in the northern part of Lassen County. There were tracks of two more smaller ones that I did not see. Twenty years ago antelope were quite plentiful in this locality, but for a good many years none has been seen there. There are several bands in the eastern part of the county.—F. P. CADY.

Fig. 33. Boat load of sardines and unloading sardines at San Diego. The sardine run has been unusually large this past winter. Photographs by Webb Toms.

SEA OTTERS NEAR CATALINA ISLAND.

On March 18, 1916, 31 sea otters, two being young ones, were seen to the south of Catalina Island. Although one has occasionally been seen in this locality before, this was the largest number, to my knowledge, counted at one time.—GEO. FARNSWORTH.

THE LEOPARD FROG IN CALIFORNIA.

Mr. George Neale has recently called to our attention the fact that the leopard frog (*Rana pipiens*) is now to be found commonly at Lake Tahoe. The attempt of Mr. Neale to obtain exact information as to the introduction of this frog into the state has not been productive of detailed information, but evidence that it was introduced is at hand. Mr. George T. Mills of the Nevada Fish and Game Commission reports that the leopard frog is found commonly at Washoe Lake, a few miles south of Reno, Nevada, but that no one appears to know whether or not they were introduced here. A restaurant man is said to have introduced the leopard frog into the Carson Valley reservoir, near Reno, where it is now very common. According to Lawrence and Comstock of the New Brockway Hotel and Hot Springs, Brockway, California, this introduction took place about eight years ago. A short time after these frogs were planted the reservoir broke and Lawrence and Comstock secured one hundred dozen, which were planted at Tallac. Here they have increased rapidly in spite of the cold winter weather.

The regular occurrence of this frog in the markets of San Francisco and the constant attempts to introduce it into other suitable localities in this state make it important that all information as to introductions of this kind be recorded so that a history of attempts at introduction in this state will be available.—H. C. BRYANT.

UNITED STATES FOREST SERVICE COOPERATION.

L. H. WHITEMAN, Editor.

GAME REFUGE PLAN SUCCESSFUL IN NEW MEXICO.

The proposed game refuge plan is approved in New Mexico. A report given out by the Forest Service there confirms the theory that deer will quickly recognize and take advantage of areas protected against hunters. According to the report made to the district forester at Albuquerque, M. L. Cadwallader, owner of a large pasture in one of the national forests, forbade it to hunters. The deer at once flocked to the pasture, and, it is said by the local forest ranger, now to contain more deer than all the rest of the district. In commenting upon this, the district forester said in part:

"The instance is said to be valuable in that it confirms the theory of the game refuge now before congress, which authorizes the establishment of a system of protected areas throughout the national forests of the entire West. The theory of the plan is that game will find refuge in the protected areas, where it will increase and overflow into the surrounding country, thereby improving the hunting outside. The refuges will also afford a means for preventing the extermination of rare species like mountain sheep and antelope, and it is claimed will relieve the present shortage of buck deer.

"The national game refuge bill, based on what is known as the Hornady plan, failed of passage at the last session of congress, in spite of widespread popular support. It is said that every game protective association and almost every chamber of commerce and stockmen's association in New Mexico heartily endorsed it. Sportsmen and forest officers are hoping that it will be enacted into law by the present congress so that the work of establishing a system of game refuges can go forward."

THE AUTOMOBILE A FACTOR IN GAME DECREASE IN EL DORADO NATIONAL FOREST.

The exceptionally fine recreational advantages to be had in the Sierra Nevada Mountains within the El Dorado National Forest draw many thousands of tourists, campers and sportsmen to the streams, lakes and favored hunting areas during the hunting and fishing season. The automobile has supplied a long felt want of rapid transportation for sportsmen and has resulted in an increased

amount of fishing and hunting. This in turn has to a considerable extent resulted in a decrease in the number of wild game, especially deer, quail and grouse. Except in the higher mountains, remote from roads and trails, there is annually a decided reduction in the number of grouse. Mountain quail are also decreasing slowly but surely. The number of bucks reported killed annually during the open season (not including the number of does and fawns that are killed, and bucks out of season, and all species killed by predatory animals) is, no doubt, exterminating the deer quite rapidly.

The proposed establishment of game refuges by the federal government in cooperation with state legislative enactment, will aid materially in the propagation of wild game. Three refuges are proposed for the El Dorado National Forest located in the extreme northern, extreme southern and central portions, all bordering on or near the western boundary and extending far enough east to afford game protection during summer and winter.—E. J. KOTOK.

SUGGESTED CHANGE OF PRESENT TROUT LAW.

As the number of fishermen increase along the north fork of Eel River it becomes more and more noticeable that the canning of the Eel River steelhead as a trout is working some hardship on the sportsmen. As the law is now, the limit is 50 fish, or 10 pounds and one fish, or one fish of 10 pounds or over. As very many of these fish weigh over 10 pounds, a sportsman catching one of, say, 11 pounds weight, would be obliged to stop for the day. This, it seems to me, is somewhat of an injustice, and I would suggest some plan whereby the limit would be three fish per day regardless of weight.—C. V. BREBETON.

SQUIRREL POISON AND RATTLESNAKES.

The statement in the October number of CALIFORNIA FISH AND GAME that the eating of poisoned squirrels will kill rattlesnakes appears to have been questioned. Here is an incident I give for what it is worth:

The members of Camp No. 1, of the Biological Survey, on the California Forest last year, found a rattlesnake writhing in a fit and half dead. Upon killing the snake they found it had swallowed a squirrel and they readily determined that the squirrel had been eating poisoned grain. It is probable that the squirrel was not dead when seized by the snake, but at any rate it seems positive that the strychnine will kill rattlesnakes. In connection with this, the records of the Covelo District for the past seven years show definitely that the snakes are decreasing in number.—C. V. BREBETON.

TROUT PLANTING IN THE SANTA BARBARA NATIONAL FOREST.

Through the efforts of Forest Supervisor Hall a number of streams in the Santa Barbara National Forest were stocked last autumn with trout fry supplied by the Fish and Game Commission. In each case the fish were planted above impassable falls where no fish were to be found. Bouquet Canyon received 4,000 eastern brook; Lime Canyon, a branch of Cachuma Canyon, received 2,500 rainbow and 25,000 Loch Leven; Rincon Creek received 5,000 steelhead.

CALIFORNIA FISHERY PRODUCTS FOR THREE MONTHS ENDING DECEMBER 31, 1916.

Species of fish	Del Norte and Humboldt	Sonoma, Mendocino, Lake	Marin	Solano, Yolo	Sacramento, San Joaquin	Alameda, Contra Costa	San Francisco, San Mateo	Santa Cruz	Monterey	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego	Other counties	Mexico	Totals
Albacore											4,568,668		37,444			4,606,112
Anchovy								1,500	191,170		2,000					194,670
Barracuda										5,500	185,470	1,168	2,180		328,218	524,536
Bonito										1,468	117,560	440	52,847		14,715	187,030
Bocnecio							2,390		51,395							53,785
Bluefish																
Chilipepper							8,799		42,758							51,557
Carp				4,849	9,367	18,248										32,464
Catfish		9,241		10,616	23,397	3,227										46,481
Cowfish						2,580		7,560	19,390							29,530
Cultus cod	18					121,719		49,931	51,881							223,549
Dogfish									165		1,290					1,455
Flounder	494		1,668			532	5,411				320		240			8,465
Halibut	5,709						540	1,800	1,347	41,012	33,201	8	34,045		915,344	1,031,406
Hake							36,290	12,650			7,092	201			6,847	63,080
Herring	716		84,970					100	51,950		1,295					139,031
Kingfish							330	5,650	9,193		132,440		1,820			149,433
Mackerel								15	591	50,126	279,119	605	55,706		80,124	466,286
Mullet														10,447		10,447
Pike				14	50	5,001										5,065
Pompano							28		11		1,957					1,996
Perch	19		10,681						290		60,997	10				71,997
Rock bass											74,515	1,949	43,293		18,562	138,319
Rockfish	621						223,302	287,573	357,402	20,016	501,631	407	82,894			1,473,846
Sole							1,078,428	467,992	11,911		75		320			1,558,726
Salmon	1,882,024	3,495		33,041	11,760	744,517		1,000	88,500							2,767,337
Smelt	78,183		2,083					12,845	40,571	10,930	114,502	72,125	45,180			376,439
Sea bass (white)			4,732					620	2,193	16,008	30,774		1,560		69,208	124,495
Sea bass (black)											7,645	160	66,634		22,361	96,800
Sand dab							322,580	102,580	1,844		3,594					430,598
Striped bass		207		16,580	37,854	162,322								207		217,169

Total fish	1,304,286	12,843	115,541	70,821	85,402	1,270,035	1,696,792	969,208	7,232,650	117,156	9,031,401	78,146	2,791,704	11,041	1,402,302	26859,626
Crabs (doz.)	1,179						15,187	1,248	926							18,491
Shrimp, lobster										12,240	65,500	10,064	53,023		36,328	177,983
Shrimp							100,013									100,013
Squid								177	37,397		6,973	597	380			45,124
Clams							2,598	1,462	632							4,692
Clams (Pismo)								3,756		38,903						42,659
Clams (soft-shell)			2,517								6,177					8,694
Clams (razor)		1,980	86,926			32,602	7,689									129,198
Clams (pismo)	10,668	240	5,080					1,385			160					16,933
Oysters (gal.), No.							1,146,700									1,146,700
Abalones			2,086					270	117,040	1,675						121,071
Mussels										510	15,248					15,758
California oysters			845													845

VIOLATIONS OF THE FISH AND GAME LAWS.

December 1, 1916, to February 28, 1917.

Offense	Number of arrests	Fines imposed
Game.		
Hunting without licenses	36	$410 00
Deer, close season, killing or possession	23	545 00
Spiked hooks—illegal deer bides	1	175 00
Ducks, close season, killing or possession; excess bag limit	12	230 00
Shooting ducks from power boat in motion	8	55 00
Using a live or imitation blind	2	
Night shooting	2	50 00
Quail, close season, killing or possession	3	105 00
Shore birds—killing or possession	2	30 00
Nongame birds—killing or possession	14	141 00
Tree squirrels—killing or possession	1	25 00
Total game violations	101	$1,841 00
Fish.		
Angling without licenses	8	$150 00
Fishing for profit without licenses	9	50 00
Trout, close season; excess bag limit	9	270 00
Striped bass, undersweight	1	
Black bass, possession, close season	2	30 00
Young of fish in possession	1	
Crabs, undersized	7	70 00
Clams—excess bag limit; undersized	10	48 50
Abalones—undersized	7	120 00
Lobsters—undersized and oversexed	5	95 00
Seining within 750 feet of a wharf	6	90 00
Illegal fishing apparatus	24	310 00
Total fish violations	89	$1,408 50
Grand total fish and game violations	190	$3,297 50

SEIZURES—FISH, GAME AND ILLEGALLY USED FISHING APPARATUS.

December 1, 1916, to February 28, 1917.

Game.		
Ducks	2,418	
Geese	198	
Deer meat	600	pounds
Cottontails	7	
Quail	9	
Nongame birds	15	
Squirrels	1	
Beaver pelts	6	
Deer hides	1	
Fish.		
Striped bass	485	pounds
Salmon	264	pounds
Trout	400	pounds
Black bass	382	pounds
Crabs	502	
Clams	651	
Abalones	69	
Prepared abalone	500	pounds
Lobsters	59	
Miscellaneous fish	40	pounds
Nets	18	
Fish traps	12	
Set lines	1,500	feet
Chinese shrimp or bag nets	64	
Searches.		
Illegal fish and game	38	

STATEMENT OF EXPENDITURES FOR THE MONTHS OF OCTOBER, NOVEMBER AND DECEMBER, 1916.

	October	November	December
General Administration.			
General administration	$1,562 68	$1,599 39	$2,199 92
Research, publicity and education	387 94	296 33	288 67
Printing	339 77	202 20	
Fish exhibits	451 85	83 50	
Game exhibits	28 29		
Game farm	312 70	202 21	222 66
Monterey fish hatchery	160 00	220 00	200 00
Lithographing hunting licenses			
Lithographing anglers' licenses			738 30
Hunting license commissions and refunds	2,993 50	876 20	2,106 60
Anglers' license commissions and refunds	1,432 50	669 90	1,281 79
Market fishing license commissions and refunds	181 00	36 50	
Totals	$7,747 33	$4,093 73	$7,229 45
Patrol.			
San Francisco District	$5,485 78	$5,018 66	$4,089 62
Sacramento District	5,307 36	3,497 12	3,933 10
Los Angeles District	2,005 68	1,966 05	1,767 41
Launch patrol	828 61	719 18	966 30
Prosecutions—fish and game	243 68	384 10	31 40
Oyster inspection	100 00	100 00	100 00
Winter game feeding			
Accident and death claims	12 00		
Totals	$12,285 11	$11,644 06	$11,190 84
Department of Fish Culture.			
Hatchery administration	$893 90	$776 10	$816 42
Mount Shasta Hatchery	1,202 23	1,825 46	1,618 65
Mount Shasta Auxiliary Stations			25 00
Mount Whitney Hatchery	680 78	614 77	742 41
Mount Whitney Auxiliary Stations	256 91		
Tahoe Hatcheries	64 37	10 50	10 00
Tahoe Hatcheries Auxiliary Stations			
Market-Chasen Hatchery	185 45	181 95	207 35
Fort Seward Hatchery	743 21	398 14	437 57
Upper Hatchery			
Sisson Mountain Station	3 05	7 00	
Brookdale Hatchery			16 00
Santa Cruz station	576 38	75 00	31 00
Anderson Station	1,067 48	229 24	6 00
Bear Valley Hatchery	32 87	154 67	8 75
Yuba City Shad Station	1 05		
Fish distributing	1,471 78	488 24	902 58
Fish transplanting	124 30		10 00
Screens, fishway, water pollution	529 31	595 15	595 79
Totals	$6,972 27	$5,397 24	$4,760 43
Commercial Fisheries Research and Patrol.			
Fishery research and patrol	$449 26	$512 85	$344 72
Grand totals	$35,454 37	$21,188 88	$23,487 44

—*From drawing by Charles Bradford Hudson*

QUINNAT SALMON *(Onchorhynchus tschawytscha)*

CALIFORNIA FISH AND GAME

"CONSERVATION OF WILD LIFE THROUGH EDUCATION"

Volume 3 | SACRAMENTO, JULY, 1917 | Number 3

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A SYMPOSIUM ON NEW FISH AND GAME LEGISLATION.

NEW FISH LEGISLATION.

By W. H. Shebley.

Of all the new legislation that of most general interest to fishermen is the act providing for the earlier opening of the trout season. Because of general demand by fishermen of the coast section, the trout season will hereafter open on April 1, instead of May 1. Although reasonable regarding the coast streams, this new law will allow the taking of fish during the spawning season throughout the mountain districts, with the exception of the new fish districts 24 and 25, where the season opens June 1, after spawning is practically over.

By another act the season on golden trout will henceforth open on July 1, instead of July 31.

Agitation regarding the prohibition of the use of salmon eggs in angling, which was noticeable during the early part of the legislative session, stirred up so much adverse sentiment that the matter was dropped even before a bill had been framed.

An act prohibiting the sale of trout met with considerable opposition by the fishermen of Lake Tahoe. Every argument advanced in favor of the nonsale of game can be used in defense of the nonsale of trout. The act was finally passed and it is hoped that fishing conditions about the mountain lakes will steadily improve. Stopping the sale of trout means that the angling of Lake Tahoe, and other mountain lakes, will be open to all those who will take the trouble to enjoy it. The new law will take effect November 1, 1917.

Needed protection for salmon, shad, and striped bass, during the spawning season, is provided by an act which closes the season for these fish from June 6 to July 31.

Henceforth the black bass season in the entire state will open on May 1. A closed season for black bass in Clear Lake, Lake County, is provided for in the same bill.

The act relating to the domestication of fish has been amended and greatly improved.

The act relating to the construction of fishways was amended, making it possible for a company to provide a hatchery in lieu of a fishway. In some cases it has been found well nigh impossible to construct a fishway over some of the large dams recently constructed in the state. The new law makes it possible to restock the waters above such dam by means of a hatchery paid for by the company building the dam, but constructed under the supervision of the Fish and Game Commission.

LEGISLATION AFFECTING THE COMMERCIAL FISHERIES.

By N. B. Scofield.

The legislature which adjourned at noon on April 27, 1917, enacted several laws of importance to the commercial fisheries of the state. Three of these laws stand out from the rest, not only in importance but in being radically different from the ordinary line of legislation. These three are what were known as Senate Bill No. 767, by Senator Thompson; Senate Bill No. 87, by Senator Luce, and Assembly Bill No. 73, by Assemblyman Mouser.

Senate Bill No. 767, also known as the Fisheries Tax Bill, provides that all packers, canners and curers of fish, and all wholesale dealers in crustaceans or mollusks shall pay to the state a tax of 2½ cents for each 100 pounds of fish received for use in other than its fresh condition, or of crustaceans and mollusks received irrespective of the form in which they are to be used. The money thus collected is to go into the fish and game preservation fund to be used for fisheries patrol and investigation work in the districts from which the revenue is derived. Although this tax is new in this state, such a tax has existed for years in nearly every other seacoast state. The recent remarkable growth of our commercial fisheries makes it necessary to maintain a more adequate patrol so that the present conservation measures may be enforced. It also makes it

more necessary to conduct investigations of our food fishes, so that we will be able to conserve the supply with intelligence. The revenue derived from this tax, while it is much smaller than in other states, will enable the fish and game commission to do much more than it has in the past. It will be able at once to provide a seagoing patrol boat for southern waters, and already the services of a fisheries investigator have been secured.

Senate Bill No. 87, known as the Fish Exchange Bill, gives the State Market Director the power to control the fresh fish markets of the state. By this bill the market director can fix the maximum price to be charged by the retailer, the wholesaler and the fisherman for all kinds of fish used in the fresh state. Wholesale and retail fish dealers will pay a license in proportion to the amount of fresh fish handled, which revenue will be mainly used in popularizing the use of the less well-known but good species of fish by advertising. Past investigations of the Market Director have convinced him that, contrary to the prevalent belief, the fish dealers are none of them making great profits; that the comparative high cost of fish is due to marketing conditions and to the fact that the public has never acquired the habit of eating fish. It is his plan to reduce the cost of fish by increasing the consumption and by inducing the people to eat fish more than once a week and on other days than Friday. If dealers can sell more fish and on more than one day a week they will be able to sell cheaper. It has been demonstrated that reducing the price of fish will not materially increase the consumption unless accompanied by advertising. The Market Director will advertise the fish and as the consumption increases the cost will be correspondingly reduced. Fish constitute one of the natural resources that still belong to the people of the state, and just as it is right and proper for the state to control the catching of fish, so is it proper for the state to control the marketing of its fish.

Assembly Bill No. 73 entrusts the regulation of kelp harvesting to the Fish and Game Commission. Under the provisions of the bill a tax of 1½ cents per ton of wet kelp harvested will be paid to the state. Two-thirds of this revenue will go to the Fish and Game Commission for patrol work and one-third to the Scripps Institution for scientific investigation work on the kelp. Since the supply of potash from Germany has been cut off this country has had to look elsewhere for its potash. Our source of potash that this necessity has developed is the giant kelps or seaweeds growing along our Pacific Coast. At least $3,000,000 has been invested in the industry in southern California. The United States government is investing $175,000 in an experimental plant at Summerland, Santa Barbara County, for the purpose of working out economical methods of extracting the potash and of utilizing the by-products, so that the industries may be able to continue at the reduced price of potash that is sure to come after the war. The government and the companies engaged in kelp harvesting realized that supervision of some sort was needed for the conservation of the kelp beds. The matter of jurisdiction was taken up with the Solicitor General and he rendered the opinion that the kelp beds are under the jurisdiction of the state.

The government representative and those engaged in the industry then took the matter up with the Fish and Game Commission and the Scripps Institution with the result that Assembly Bill No. 73 was drawn up according to the ideas of all concerned.

There was no opposition to the main features of the bill, but the amount of the tax created considerable discussion. The idea had gone forth that the kelp companies were making immense profits and several of the legislators thought that the tax of 1½ cents per wet ton that was proposed in the bill was entirely too low. An expert accountant was sent to southern California by the Board of Control to investigate the claims of the larger companies that they are operating at a money loss. The report of this accountant satisfied the Committee on Revenue and Taxation that their statements were correct and the bill was passed out with favorable recommendation. It is hoped that the work of the government's experimental plant, together with the work carried on in the chemical laboratories of the larger companies, will be so successful that the manufacture of potash and other products from kelp will remain as a permanent industry after the war.

Other acts of interest are those providing for: The nonexport of abalones; an increase in the minimum size of spiny lobsters from 9 to 10½ inches and the maximum size from 13 to 16 inches; and prohibition of the taking of oysters from beds quarantined by the State Board of Health.

NEW GAME LEGISLATION.

By J. S. Hunter.

Probably no measure ever passed by a California legislature will have so far-reaching an effect on the supply of game as Assembly Bill No. 759, introduced by Mr. Lyon. This bill, which was an amendment of the former districting act, creates sixteen new game refuges. These refuges are scattered throughout the Sierras and the Coast Range, and in connection with those already established, together with national parks, will form a chain of refuges reaching from the Oregon line to the Mexican border. The smallest one of these new refuges, situated on the north side of the Klamath River, comprises 8,960 acres; the largest, near the headwaters of the Sespe River, in Ventura County, includes 125,440 acres. The new refuges add 811,180 acres to the areas already set aside, making a total of over 1,500,000 acres set aside as game refuges in California. In the refuges all hunting, except for predatory animals under permit from the Fish and Game Commission, is prohibited. There will be no special restrictions on fishing. So long as these refuges endure the state will have a permanent supply of game. Another bill provides for a game refuge in the vicinity of Mount Tamalpais. The possession of guns in this sanctuary is made unlawful.

Radical changes were made in the so-called "Bowman Act" of 1913, providing for the breeding of game in captivity. The most important change is that in the cost of a breeder's license. Under the old law the license of $25 deterred many people from going into the business of

raising and selling domesticated game. The license fee is now $2.50. More reasonable provisions as to the marketing of game reared in captivity are also provided.

Needed legislation protecting fur-bearing animals during the summer season when their fur is of no value is to be found in the trapper's license law. Fur-bearing mammals are defined, and a license costing $1 is required of all who trap for profit. Protection for the black bear and fisher are included. Fundamental information looking toward more protective legislation for fur-bearers will be derived from the reports required of each trapper.

Fig. 34. Black bear in Yosemite Valley near Camp Ahwahnee. Photograph by Miriam Gibbons. The black bear is now given protection during the summer season when its fur is of no value.

Needed protection for sage hen and grouse is to be found in two bills, one which provides for the total protection of the sage hen in Mono and Inyo counties, the other for a reduction of the season on grouse to one month, September 15 to October 14, inclusive. The season on valley and desert quail will henceforth open one month later (Nov. 15), but will not close until the first of February.

In order that there might be no confusion between state laws and the Federal Migratory Bird Law, the season on waterfowl was made to conform with the federal law. The season now opens on the sixteenth of October, and all shore birds, with the exception of the jack snipe, are protected.

Of great interest to deer hunters is the new act providing that a deer lawfully killed in an open district may be taken into a closed district after proper affidavit has been made. The man who could not take

his vacation until after the season closed in his own district has heretofore been unable to bring back with him venison which he secured in another district. The former law not only made it inconvenient, but oftentimes forced a waste of a valuable food supply. The law protecting elk was strengthened by making it a felony to have elk meat in possession. The act providing for the forfeiture of the license upon a third conviction for a violation of any of the fish and game laws should be instrumental in creating greater respect for all of the fish and game laws.

A change in the season on doves, making the season open in District 1 on August 1 instead of September 1, is a step backward. Many doves are still nesting in August.

The periodical attempt to remove certain nongame birds from the protected list this year resulted in the placing of the blackbird among the unprotected birds in Districts 1, 2, and 3, because of their damage to rice and other growing crops. So little damage is done by blackbirds in southern California that the birds are still protected in District 4. After the first day of November, 1917, a state law will prevent the sale of aigrettes, plumes of the osprey and bird of paradise, or other plumes or feathers.

A bill placing the black-tailed jackrabbit among the predatory animals gives needed relief to the man who has had to withstand the attack of this animal, because it was classified by law among the game mammals. Other items were passed which amended slightly the existing laws. These changes will be noted upon the abstracts, soon to be issued by the Fish and Game Commission.

There were many attempts to introduce bills to tear down the protective laws already passed. Several attempts to take protection from valuable nongame birds failed, as did also attempts to place bounties on predatory species. Alleged destruction of crops by ducks and geese led to an attempt being made to allow the killing of these birds where they were doing damage, but this dangerous bill did not pass out of the hands of the committee. Two dangerous bills, one providing for the appointment, by the Governor, of one fish and game commissioner, with a salary of $5,000 a year, and with $20,000 worth of patronage at appointee's disposal, and another one providing for the transference of all fish and game license funds to the state treasury with a small appropriation therefrom for the work of the Fish and Game Commission, fortunately were killed in committee.

DEVILFISH AND SQUID.

By Harold Heath, Department of Zoology, Stanford University.

From time immemorial it has been customary for illiterate, untrained and superstitious races of men to apply the adjective "devil," or its equivalent in other languages, to animals having a horrible, terrifying appearance or some fancied, mysterious power of creating evil and bad luck generally. In the English language we have the name devilbirds or owls, devil's coach and riding horses and devil's darning needle among insects, a skeleton-like shrimp is known as the devil shrimp, and finally there are the devilfishes, animals related to the squid, cuttlefish, nautilus and scores of less familiar relatives.

That the epithet "devilfish" should have been applied to these last named creatures is not surprising, for some of them at least have not

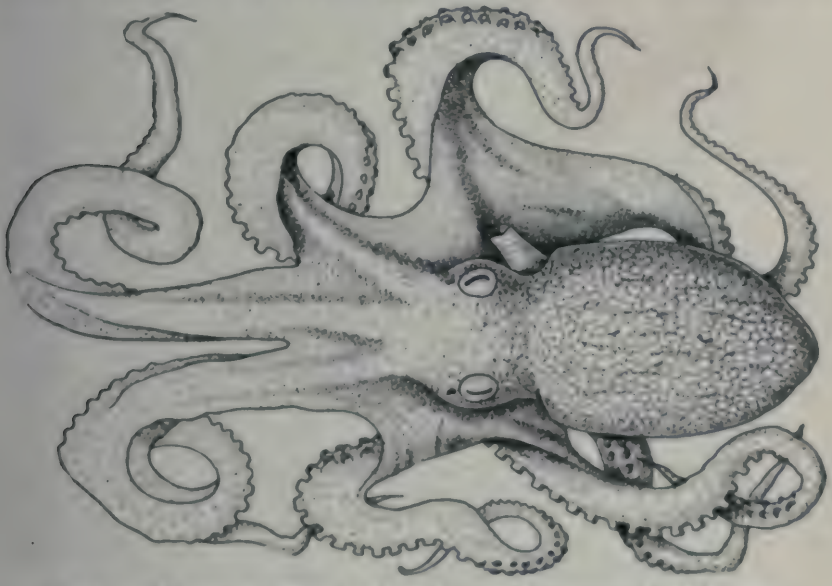

Fig. 35. The common devilfish (*Polypus* [*Octopus*] *hongkongensis*) of California.

been endowed by nature with a prepossessing appearance. Long, snaky arms bearing hundreds of suckers, sinister looking eyes, a lumpy, ungraceful form of body, and the creepy sensation produced by the cold, clammy suckers when they fasten to naked flesh is enough to relegate the whole tribe to the abode of evil spirits. Furthermore, the dislike we instinctively feel for these animals has been unduly heightened by a line of story-tellers headed by Victor Hugo and ending with the fisherman on the dock. All have let their fancy have free rein and fact is often as difficult to find as snakes in Ireland.

Before we attempt to separate fact from fiction certain matters call for consideration. In the first place, it might be inferred from the names devilfish, cuttlefish, ink fish and so on that these animals are closely related to the true fishes. Correct it is that certain species are active swimmers endowed with keen senses and are able to stalk their

prey as successfully as the herring, sardine, or any other fish. Nevertheless, all devilfishes, squids, the nautilus—a thousand or so species in all—are in reality mollusks or shellfish related to the abalone, mussel, oyster and kindred types. At first sight there is indeed very little to suggest that the abalone and the squid for example, are blood relations; in fact, it is only with the greatest patience that students of zoology have discovered the true state of affairs. We now know that the arms of a squid or devilfish (fig 35), borne on the head, form collectively a modified foot corresponding to the flat creeping sole that anchors the abalone to the rocks, and to the hatchet-shaped lobe that drives the Pismo clam through the sand. For this reason, the class comprising the devilfish, squid, cuttle, nautilus and their relatives are known as cephalo-pods, meaning head-footed animals. It may be added that the devilfish alliance possesses eight arms while the squids have ten, two of which are two or three times as long as the others (fig. 37). Furthermore, the members of the squid group can be distinguished from the devilfishes by the presence of two leathery flaps or fins at the hinder end of the body.

In addition to these features, the portion of the body lying next to the shell in the abalone—the so-called visceral hump—has been drawn out into a cigar-shaped body in the squid, and the "backbone" or pen it conceals beneath the skin, is a rudimentary shell. In the devilfishes the body is more rounded and the shell disappears completely in early life. In the squid-like sepia or cuttlefish the shell or cuttle bone is relatively large and like a porous stony plate is a familiar object in canary bird cages. In this connection it may be added that in olden days, and even yet in certain districts, powdered cuttle bone was reputed to have a mysterious power of curing colds, a teaspoonful in a cup of water being deemed sufficient to produce a health-giving sweat.

In similar fashion it is possible to trace a resemblance between the various internal systems of organs in the abalone, for example, and the head-footed group, finding in all a well-developed heart and connecting blood vessels, a clearly defined nervous system with "brain" and nerves extending to all parts of the body, and finally there is a complicated kidney and reproductive apparatus. It is popularly believed that the abalone and oyster are among the humble beings of earth, but humility is certainly not synonymous with simplicity of organization; for all of these animals, the squids and devilfishes included, are not far behind the lowest backboned animals when the architecture of their bodies is considered.

It should be noted, however, that although the devilfish-squid alliance is constructed upon the same fundamental plan as the abalone-clam aggregation, the first-named group is provided with several features fitting them for an active aggressive type of existence. The eyes on the head are as highly developed as those of a fish, the senses of smell and touch are keen, and there is reason to believe that the sense of taste is acute. Thus provided, they are enabled to steal upon their prey and to avoid enemies to a highly successful degree. To agility and naturally acute senses should be added their surprising ability to change their color to harmonize with that of their surroundings, so that prey and enemies alike are usually unaware of their proximity. This color change

is based upon minute elastic sacs (fig. 36) filled with pigment and supplied with muscles for causing their expansion. As a devilfish crawls about on the sea bottom its color can be seen to change in a twinkling from deep chocolate through dull red and brown to gray. If sand or rock is encountered on the journey the skin is usually thrown into lumps and ridges, so that under all conditions the body is practically invisible. The squids have an even greater range of color change, some species being capable of assuming almost every tint of the rainbow. If it should happen that some keen-sighted enemy, such as a wolf fish or eel, should spy out any of these chameleon-hued animals a further means of escape is provided by the so-called ink bag. In every case this is a bag concealed within the body and filled with a brownish or black fluid having the same appearance as india ink. This is squirted into the face of any formidable intruder and in the gloom thus produced the attacked is enabled to steal away to a place of safety.

As a concluding remark to this section of the paper, attention will now be directed to the method of cephalopod locomotion, which is without a counterpart among the remaining members of the animal kingdom. If a devilfish at rest upon the sea bottom or in an aquarium be watched for a time its body will be seen to contract and expand every few seconds. With each expansion a slit in the neck region, and leading into a spacious cavity within the body, opens to permit the entrance of a stream of water supplying oxygen to the two feathery gills concealed within. At the outset of the contracting movement a valve prevents the outgoing stream of water from escaping as it came, and directs it through a tube or funnel, also known as a siphon, which can be seen on the right side of the neck in figure 35. These gentle periodic movements are associated with breathing. If the animal is disturbed the movements become more active and if sufficiently violent the water stream escaping by the funnel drives the animal backward as escaping gases drive a sky rocket. In this way all cephalopods can move, often with the rapidity of a fish of the same size, but the movement is invariably backward. When a devilfish moves forward it creeps along by means of its flexible snaky arms and suckers. The members of the squid group, on the other hand, move with equal facility backward or forward, the forward movement being brought about by the fins.

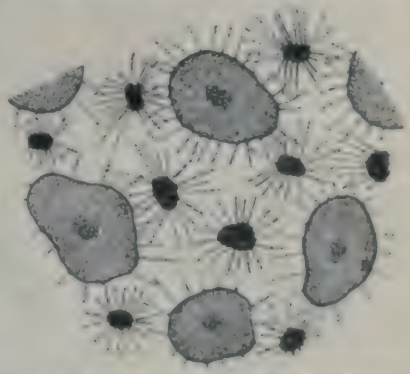

Fig. 36. Color sacs in the skin of any cephalopod. In this case the body is red owing to the expansion of the red sacs, while those containing brown, blue and yellow pigment are contracted.

Coming now to the subject of California cephalopods we learn from a recent report, "A Review of the Cephalopods of Western North America by S. S. Berry—Bulletin of the Bureau of Fisheries, Vol. 30, 1910," that fifteen species have been recorded from the waters adjacent to the coast. Four of these are true devilfishes, an equal number are close relatives, while the others are squids or allied species. Of the two devilfishes

occurring in shallow water along shore, one (*Polypus* [*Octopus*] *bimaculatus*) is rather rare and ranges from the southern part of the state to Panama. The second species (*Polypus hongkongensis*), a familiar object in the city markets, has a remarkably wide distribution, being found along the western coast of North America and eastern Asia from Panama to Hongkong, China. This species is usually not over three or four feet in length, though occasionally specimens have been reported of enormous size, having arms ten feet or more in length. With one exception (the paper sailor), the other eight-armed species are very rare indeed, since they live on the ocean floor at depths ranging from six hundred feet to two and one-half miles.

The paper sailor, paper nautilus or argonaut (*Argonauta pacifica*) is an inhabitant of warmer waters, ranging as far north as the bay of

Fig. 37. Methods the squid and devilfish employ to capture prey.

Monterey, and during storms is ocasionally cast ashore. Unlike the other California devilfishes, these animals swim at the surface of the sea, and, unlike any other cephalopod, the female, by means of her arms, secretes and moulds a beautifully sculptured shell that serves to protect her and the young. The argonauts are all of small size, of no commercial value, though their shells bring fancy prices.

Among the squids of the coast only one species (*Loligo opalescens*) is sufficiently abundant to be familiar. The so-called giant squid (*Dosidicus gigas*) occasionally migrates from the southern hemisphere, and has been captured as far north as Monterey. Full grown individuals attain a total length of four feet, but although the Golden West is the home of many natural products of record breaking size, this one, when compared with a species from Newfoundland, is a pygmy. The eastern representative has a total length of fifty feet, a body seven feet long, and its eyes have the area of Thanksgiving dinner plates. The other squids of California are relatively small, and are largely confined to deep water.

One of these last-named species has no common name but its scientific cognomen is a mouthful—*Meleagroteuthis hoylei*. It is mentioned here owing to the fact that, living at depths ranging from 3,000 to 6,000 feet, where sunlight never penetrates, it is bounteously provided with metallic-looking phosphorescent spots, which in life must light it up like a man-of-war and serve either to attract prey or its mate as the glow-worm and firefly are wont to do.

Coming back to the subject of the common squid (*Loligo opalescens*), we find its range extends from Puget Sound to San Diego. At certain seasons of the year immense schools are encountered off our coast, invariably followed by seals, sea-lions, salmon and various other fishes. As the food of the squid consists of small fishes, shrimps and other small animals, and since these come to the surface mainly at night, squid fishing is usually done after the sun goes down. Several years ago when squid fishing was an important industry in Monterey Bay, the Chinese provided their sampans with metal baskets in which a fire was built and rowing about netted their unwary prey attracted by the light. Five thousand odd tons were taken in a single season and were dried on the ground, or in the case of higher grades, were cleaned and dried on racks. It is reported that the low grades were sacked together with large quantities of salt, on which the duty was high in China, and were shipped to that country as fertilizer on which the duty was low. Subsequently, the squid were used as fertilizer, but the salt was refined and sold. The choicer brands were used for soups and other dishes celestial only in name. Nevertheless, it is possible to place before the American epicurean a dish of tender squid, lightly boiled in oil, that not only is most nutritious but of most delicate flavor. The dishes of the California devilfish tested by the writer can not be described with such gusto. On the shores of the Mediterranean this article is tender and of excellent flavor, but the California product needs some softening influence to destroy its rubber-like consistency.

Fig 38. Egg masses of the devilfish (on left) and squid attached to a twig. Young are escaping on the right.

The common California squid measures about ten inches in length, and there is reason to believe that it attains its full size in one year. The eggs are laid from early spring until midsummer, and looking like small shot, though whitish in color, are imbedded in translucent, milk-colored, jelly-like masses three or four inches in length and anchored to rocks, sticks and other solid objects (fig. 38). After a few weeks the young, a quarter of an inch in length, make their escape, become an inch long by the last of August, twice this length by the middle of October, and are nearly grown by May.

In conclusion, let us return to the subject matter of the opening paragraphs. Do devilfishes and their relatives ever attack man, and is there any basis in fact for the pictures we used to gloat over in our

schoolboy days where gigantic cephalopods draped their arms about the hulls of ships with enough left over to reach half way up the main mast? Doubtless men can be found in this state who have at least one acquaintance who has heard of a man that has lost his life in an encounter with a devilfish, and curiously enough the longer the line of informants the more lurid the tale. As a matter of fact, a strong man has difficulty in dislodging a freshly caught four-foot devilfish, and when it is remembered that some of these creatures attain a length of from ten to twelve feet it is altogether possible that they could overturn a rowboat and drag the occupants down. There are several authentic accounts of battles between giant cephalopods and fishermen, but in all the literature at hand the fishermen came off victors. Generally speaking, all of these animals along our coast are of a shy, retiring disposition and are of relatively small size, so that so far as they are concerned we can continue to enjoy the climate and live our allotted three score years and ten.

NEGLECTED PACIFIC FISHERY RESOURCES.*

By John N. Cobb.

The Pacific coast has been so bountifully gifted with salmon that it has from the very beginning been difficult to develop a market for other varieties of sea food, but as the consumption of fishery products throughout the country at large increases, and methods of distribution improve, the people are indicating a desire for a greater variety from which to choose, and this will ultimately furnish an outlet for the many species which are now either neglected entirely or but sparingly used. As it has been impossible to treat of all in the compass of a paper of this class I have selected the most prominent.

The black cod (*Anoplopoma fimbria*) is very abundant in our northern waters, and large quantities are taken on halibut trawls when set in deep water. The black cod is a most delicious food fish, of firm and flaky texture; it is white in color and rich in flavor. While the market for this species is steadily widening, the supply which could be brought in far exceeds the demand.

Owing to its oiliness it is not easy to pickle-cure this fish. The best method has been found to be that of double pickling. After being in pickle once the fish are taken out and put in fresh pickle a second time from two to five days. The second pickle is then boiled and the fish are replaced in that fluid after it has cooled and are then shipped to market.

The eulachon, or candlefish, run in enormous schools in some of our Alaska streams from late in March till in May, but, although a most digestible and nutritious species, very few are eaten by the whites. They are almost invariably pickled. It is not good for canning, as the flesh drops from the bones after cooking, and when the can is opened the contents present a much jumbled and uninviting appearance. The flesh of the eulachon is said to be as restorative to the wasted human system as cod-liver oil.

*Paper read before the annual meeting of the Pacific Fisheries Society held in Seattle, Wash., on June 10–12, 1914.

The oil, which is abundant in the tissues of the fish, has very superior qualities and might be made commercially important if the proper methods were followed in its extraction and refining.

Of the large schools of herring which frequent our coast, relatively but very few are prepared for market, and these usually in a slipshod manner. Were the fresh fish selected with care and an eye to having all the fish in a barrel of about the same size, the fish gibbed and then salted carefully, and after the fish have been cured sufficiently repacked in barrels which are filled so full that the fish can not be jumbled up, the finished product would fetch prices more nearly consonant with the best foreign herring. I put up some on the Shumagin Islands in 1912 and 1913 which averaged almost one pound each in the round and ran about 225 to the cured barrel, and these brought almost the same price as the best Norwegian herring in the California markets.

Several attempts have been made on Puget Sound to build up an industry in the canning as sardines of the young herring and pilchard which frequent these waters, but all have failed through inability to compete with the cheap and abundant labor available for the Maine canneries.

In Alaska are to be found enormous numbers of Dolly Varden trout, and lesser numbers of rainbow, cutthroat and Great Lakes trout. The Dolly Varden trout are the deadliest enemies the salmon have in Alaskan waters, as they devour both the eggs and the young. Owing to their being classed in the states as game fish, it is almost impossible to find a market for them in a fresh or frozen condition. At present, the state of Washington, thanks to the broadmindedness of Commissioner Darwin, permits of their sale in the local markets. A few hundred cases are canned annually in Alaska, and these are prepared in the same manner as salmon. If medium-sized fish were selected and packed whole in one- and two-pound oval cans, they would present a more inviting appearance, and I believe a big trade in them could be built up throughout the country, as a trout label would be a novelty in the East and also one to conjure with, as the name stands for a choice article in the minds of the people.

It is a question of only a few years when the shad fishery of the Pacific coast will be of first-rate importance. At the present time it is so overshadowed by its giant brother, the salmon fishery, that it is almost lost sight of. The fish are taken mainly on the Columbia and Sacramento rivers. Most of them are marketed in a fresh or frozen condition, but some thousands of cases of both fish and roe are canned each season. The demand for shad is slowly but steadily increasing.

Whitefish (*Coregonus*) are found in many of the inland lakes and streams of the Northwest and in Alaska. Some commercial use is being made of them in Washington, where they are seined in the lakes and shipped to Chicago and to near by western states. In Alaska the whitefish has no commercial importance and is not utilized except as food for the natives who catch them. They are a delicious fish and will compare very favorably in edible qualities with the Great Lakes whitefish.

Atka mackerel (*Pleurogrammus monopterygius*) is found in large schools mainly along the Aleutian chain. Codfishermen frequently find schools when fishing around the Shumagin Islands. The fish are rather

hard to cure properly, but when the work has been well done they are delicious in flavor. In the early days of the Nome rush when the steamers made regular stops at Dutch Harbor for coal, a small business was maintained by the natives of Unalaska in selling pickled Atka mackerel, but when the vessels ceased making it a port of call, the business died out. If the name were changed and a strong effort made to exploit this species, I believe a good business could be built up. It would be necessary to change the common name because the fish is not a mackerel at all and bears no resemblance to one, it having acquired the name because of a fancied resemblance in flavor to the other species. Either of its other common names—"striped fish" or "yellow fish"—would be appropriate.

Fig. 39. Chinook salmon on floor of Monterey Packing Company's plant at Monterey. Little attempt has been made to save the by-products of the tons of salmon canned and cured along the Pacific coast.

The cultus cod (*Ophidion elongatus*), several species of the sea bass, known locally as red rock cod (*Sebastodes ruberrimus*), Sitka black bass (*Sebastodes melanops*), etc., various species of flounders, including the deep-sea sole, are excellent food fishes and are to be found in abundance along our northern coast and in Alaska. Most of them now find a limited market in the coast towns, but eventually they will be shipped to all sections of the West as their food qualities become better known.

The most remarkable instance of wholesale waste of fishery products is to be seen in connection with the great salmon industry of this coast. In 1913 some 140,000,000 salmon were used in a fresh condition, and in canning, pickling, mild-curing, freezing, smoking, etc. Estimating the loss in dressing these salmon at 25 per cent, a most conservative estimate, gives us the enormous total of 101,186 tons of offal. With the exception of about 7,000 tons which were used at a few small plants, all of this enormous total was thrown back into the water, thus, not

only wasting valuable material, but polluting the water from which the fish originally came. For various reasons not all of this material could be saved, but the amount that could be worked up into merchantable products is surprising.

Included in this enormous amount of offal are millions of pounds of salmon eggs. Although Siberia prepared 250 tons of salmon eggs as caviar in 1913, only about 24,000 pounds were prepared upon the Pacific coast of America during the same period. It is a comparatively easy matter to prepare caviar, and with a little experience almost any fairly intelligent person can do it, and it is to be hoped that some of our fishermen will turn their earnest attention to this matter.

The balance of the offal would make excellent fertilizer and oil. A few unthinking persons have blamed the cannerymen for not having done this years ago, but they must be acquitted of most of the blame. For once American inventive genius lagged behind. In the East, where the preparation of fish scrap and oil from nonedible species is an old and important industry, large plants have been established for the rendering of the fish. On this coast, where nonedible species are rare, fish offal has been the usual source of supply, and as the packing establishments are generally scattered widely, large plants could not be utilized owing to the heavy expense of bringing the offal such long distances. As a result, a small plant, capable of handling the refuse of a plant packing from 50,000 to 100,000 cases, was needed, and this has not been available at a reasonable cost until within the last two years; but as most of the ventures in this line in the past have been failures, the cannerymen are chary of investing until they see such a plant working successfully upon this material alone.

Mussels. Dr. Smith has told us in a recent circular issued by the United States Bureau of Fisheries that we ought to eat the sea mussel. I am happy to inform him that in a limited way this bivalve has for some years been marketed at various places on this coast, but there is room for an immense increase in its consumption. Large beds are frequent along this coast from San Francisco north, especially in Alaska. H. E. Westbrook has recently started to can them at his plant on Smith River, in northern California, and if the product takes well with the consuming public, others will undoubtedly take it up. Canning mussels would be a good business for the salmon canneries to take up when the salmon are not running.

Mussels are also valuable for the production of fertilizer, the so-called "mussel mud" constituting one of the best fertilizers known. It is found in places where the mussel beds are exposed to constantly depositing silt, which slowly destroys the mollusks and buries them beneath their offspring.

Clams. Clams are abundant throughout Alaska. I have personally found them in nearly every section outside of the Arctic, and it is credibly reported that there are large beds along the Arctic coast. The razor clam (*Siliqua patula*) is especially abundant in southeast and central Alaska. The mud clam (probably *Panopea generosa*) is to be found in the same regions. Almost no use is made of them at present, but some day they will prove a source of wealth to the territory. The work of canning could easily be carried on at plants erected adjacent to the grounds.

Cockles. Beds of cockles, sometimes called scallops in Alaska, are known to exist in Funter Bay, on Admiralty Island, and in Dry Strait, near Wrangell, in southeast Alaska, and would probably be found in many other places if systematic search were made. They are eaten, but not sold.

Crabs. Crabs are exceedingly abundant in Alaska, and for many years the residents have been catching and eating them. In 1909 the business of catching and shipping them to Puget Sound was first undertaken. In the beginning all were shipped alive, packed in seaweed, but so many died on the way or arrived in bad condition that finally all were boiled before being shipped. They were shipped during the

Fig. 40. Mussels on rock near Crescent City, Del Norte County, California. These shellfish form a valuable food supply which has been little utilized up to the present.

summer months when a close season on Washington crabs prevailed. Owing to certain peculiar conditions prevailing on the Sound in 1913, none were shipped from Alaska.

Owing to the cheapness and abundance of the canned crabs imported from Japan, the business of canning them has languished on this coast, but as crabs are said to be decreasing in Japanese waters it may be that eventually our packers will be able to do some business in this line.

Shrimps and Prawns. These crustaceans are in quite general use in the coast states, but their pursuit has been neglected in Alaska.

Shrimps are found in a number of places in southeast Alaska, being fairly abundant at times in the vicinity of Wrangell, while the investigations of the Albatross have shown that they are abundant in the waters of central Alaska, south of the Alaska Peninsula. Last summer, during

the month of July, I found large numbers in the stomachs of codfish delivered by the fishermen at Pirate Cove, on Popof Island, in the Shumagin Islands. They have been reported from a few places in western Alaska. As the discovery of the presence of shrimp in Alaska has been what we might term accidental, it is probable that other, and even more prolific, grounds would be found if sought for specifically.

Prawns have been found in southeast Alaska, in the vicinity of Wrangell. Some prospecting was done in 1909 and a few of these crustaceans, known to the fishermen of Puget Sound as "big-spots" (which average five inches in length), "coon-stripes" (two inches in length), and "punks" (one to one and a half inches in length) were gathered. As this was the first and only effort, so far as my knowledge extends, ever made to find these crustaceans in Alaskan waters, it is my belief that more extended search would disclose them in abundance in other sections of the territory.

Whale Meat. In Japan, whale meat is of considerable economic importance as a food product, the tail and adjacent parts and the soft piece under the eye being the choicest portion. It has much the flavor and appearance of beef. There are several whaling stations in operation on this coast, nearly all of which ship the portions mentioned to Japan. Could the prejudice against whale meat be overcome, it would prove a most important addition to our national larder.

Hair Seals. Many thousand of hair seals frequent this coast, especially in Alaska, and if properly hunted, I believe the industry could be made a profitable one, as the hides make excellent leather. A considerable reduction in the numbers of these animals would greatly benefit the salmon industry, as they annually destroy millions of these valuable fish.

Sea Urchins. The sea urchin, which is quite abundant on our coast, will some day be an article of economic importance. A few are gathered and the meat eaten by Japanese in California and by natives in Alaska.

Sea Cucumber. The Holothurian, known commonly as the sea cucumber, is a very abundant animal on this coast, but no use is made of it as yet. In the South Seas immense quantities are prepared for market by boiling and smoking, the resulting product being known as beche-de-mer. It is highly prized by orientals, who prepare a most delicious gelatinous soup from these.

Algæ. Despite the fact that the seaweed resources of this coast are not surpassed by those of any other, they are practically ignored. A number of native tribes gather, prepare and eat considerable quantities of seaweed, while small quantities are prepared by the oriental fishermen operating along the west coast for food, medicine and fertilizer.

Dulse (*Rhodymenia palmata*) is quite common on our northwest coast, and is an article of diet among the Washington and Alaska natives. The natives of Alaska usually gather dulse in the summer, dry it in the sun, press it in boxes, and then put it away for winter use. Other species of this genus grow on the west coast, while several other algæ known as dulse in Europe and used in the same way as Rhodymenia are represented by various species on our west coast. Dulse is frequently eaten as a relish in New England by the whites, and is also in quite general use in Ireland.

Vegetable isinglass could be prepared from *Gelidium corneum*, an alga which grows in abundance on our coast; this species is identical

with the one from which the Japanese prepare their vegetable isinglass. Other species (*G. coulteri* and *G. cartilagineum*) exist on the coast of California.

One form of agar-agar, now so extensively used in making culture media in bacteriological work, could also be prepared from *Gelidium*.

Laver (*Porphyra laciniata*) is found in abundance along our entire coast, but is not collected, except sparingly, by Chinese, although large quantities are imported by orientals living in this country. Laver grows abundantly in bays and near the mouth of rivers. In Japan this alga is cultivated and most of the crop is sun-dried. The green laver, or sea lettuce (*Ulva latissima*), which is abundant on all our coasts, is eaten in Scotland, and is also eaten with meat or as greens by native tribes of our northwest coast.

The giant kelp (*Nereocystis lutkeana*) is found in great profusion on the Pacific coast from Monterey Bay northward. The natives of this coast have made considerable use of this alga, while curios are made from the various portions of the plant and sold to tourists visiting California.

In 1906 two professors of the University of Washington invented a process for making a product resembling citron from the giant kelp. When made from the bulb it was a difficult matter to detect the difference between it and the real citron. The flavor was, of course, artificial.

Numerous species of *Laminaria* exist on the northern part of this coast, and the only use to which the plants are now put is for fertilizer. Many of these could be prepared in various ways as food and would doubtless meet with an encouraging reception if properly introduced.

Many species of algæ, identical with or similar to those used in Scotland, France, and Japan in the manufacture of iodine, abound on our northwest coast, but are never used for this purpose, despite the fact that this country is a large consumer of iodine, and its preparation in crude form is a comparatively simple matter.

Nearly all marine algæ contain iodine, but a few have such a comparatively large quantity that they are used almost exclusively. The Atlantic kelp yields the highest percentage of iodine, while the Pacific kelp yields a much higher percentage of potash, five or six times as much as the Atlantic kelp.

During the extraction of iodine, algin, cellulose, dextrin, mannite, potash, chloride of potassium, and carbonate of soda are also produced. As this country imports annually about $13,000,000 worth of potash, all of which could be produced from seaweed, we are criminally wasting our resources.

As a direct fertilizer fresh seaweeds have been in use for many years by farmers living on or near the Atlantic coast, but very little use has been made of it in this manner on this coast.

Owing to its large content of water, the total quantity of fertilizing ingredients in plants is very small in proportion to the weight of the material. As the plants decompose rapidly and the water separates from them quickly, during which operations the fertilizing constituents, especially the nitrogen, waste away, it is important that the plants be used within as short a time as practicable after they have been collected.

Seaweeds have a mechanical action on the soil, tending to make it friable and binding its constituents together. They also have an advantage over barnyard manure in the freedom from seed of land weeds.

CALIFORNIA FISH AND GAME

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All material for publication should be sent to H. C. Bryant, Museum of Vertebrate Zoology, Berkeley, Cal.

July 20, 1917.

Let the interest be keen and new views will open up; new trees will grow; new birds will fly; new fish will swim and then will our gallery be filled with new and glorious pictures of Things Worth Seeing. —Osceola in *Forest and Stream, Feb., 1917.*

LEGISLATION.

Believing that many will be interested in the constructive legislation relating to fish and game passed by the 1917 legislature, there appears on another page a symposium giving the various new laws and changes in old laws affecting fish, commercial fisheries, and game. Conservationists should feel elated over the splendid advance made.

SAFETY FIRST DURING THE HUNTING SEASON.

Soon after this number of CALIFORNIA FISH AND GAME reaches our readers, the hunting season will have opened. Too much emphasis can not be laid on "SAFETY FIRST" measures. A glance at the record of hunting accidents for the past season, published in the last number of CALIFORNIA FISH AND GAME should be proof enough of this fact. Cut out the following "Safety First" card as suggested by B. A. Fedde (Recreation, Oct., 1915, page 192), carry it with you, and tack it up in your camp so that you may be constantly reminded:

REMEMBER!

The other fellow is probably dressed in brown or gray or black and may be creeping.

Put on your red coat before leaving camp.

No loaded gun lying around camp.

Don't go into the thickets.

Don't crawl or creep.

Make sure his horns are full four inches and branched. Then you won't hit a man; nor will you have a fine to pay.

Be sure you see and KNOW what you aim at.

Better carry home disappointment than a wounded man.

RULES FOR HANDLING OF LOADED GUNS.

There is a fundamental rule in the handling of loaded firearms which, if observed by all, would prevent hundreds of casualties every year. That rule is simply: "Don't point the muzzle of the firearm toward another person, especially when the gun is not loaded." If this rule is strictly observed, the other elements of danger in the handling of firearms are very remote.

Not one gun in a million will burst with the charge except from carelessness in allowing the muzzle to become clogged with mud, or a top wad may become loose from poorly-loaded ammunition. When used in a double-barrel gun, the concussion of the discharge of the first load may loosen the wad in the other barrel, which may lodge in the choke of the barrel. Don't buy cheap ammunition.

A person who shoots at an object without being absolutely sure of the character of the object should be declared "*non compos mentis.*" He is a menace to public safety, and needs a guardian.

Always remove the shells before entering the house or camp or before climbing into a vehicle. In crossing over a fence, if you don't remove the shells, first, lay the gun on the ground lengthwise to the post. In this way the gun is never pointed toward you in laying it down or picking it up.

Don't stand a loaded gun against a tree or a vehicle. Take the loads out of the chamber.

Always watch out for the other fellow. If he is careless, shun him as you would a plague. Real sportsmen would not kill or maim a person.—GEORGE NEALE.

OIL POLLUTION.

Some of the first constructive conservation work accomplished by the California Fish and Game Commission was that in connection with the pollution of streams.

For many years a great number of valuable fish were destroyed due to the immense quantities of refuse, sawdust, slag, chemicals and oils dumped into the streams of the state. The good laws now obtaining have been rigidly enforced and pollution of this kind is now infrequent.

Pollution of ocean waters, due to the pumping of bilge water and emptying of ballast tanks still continues. Not only do many sea birds fall victims to the oil on the surface of the water, but this oil also destroys the plankton used as food by many valuable food fishes. Pollution of this kind is much in evidence near the Farallon Islands, and it is no uncommon sight to see hundreds of murres and other sea birds which nest on the Farallons so saturated with crude oil that they are unable to fly.

We are reliably informed that the Standard Oil Company has taken measures to stop this sort of pollution, and that there has been a resultant saving of oil rather than an increase of expense. It is necessary that immediate pressure be brought to bear on other oil companies so that similar preventive measures may be instituted. Any steps taken to reduce oil pollution in the waters along our coast will not only benefit the sea birds, but will be a conservation measure of direct effect on our supply of food fishes.

OUR PART IN THE CRISIS.

We wish to call to the attention of our readers pertinent sentences which appeared in a statement recently issued to farmers by President Woodrow Wilson. The present crisis demands thoughtful action on President Wilson's suggestions.

"This is our opportunity to demonstrate the efficiency of a great Democracy, and we shall not fall short of it!"

"The supreme test of the nation has come. We must all speak, act, and serve together!"

Cannot these suggestions be followed in efforts to conserve our wild life as well as in the endeavor to conserve other natural resources?

PREVENT WASTE.

As soon as there is a noticeable food shortage, attention is immediately directed toward wild life as a food supply. Most of the European countries at war have fortunately prevented extermination by passing rigid laws. In the present crisis it is very important that every tendency to abandon temporarily the seasons and bag limits on game should be quashed. Maximum use should be made of wild birds and animals, but the future as well must be considered.

Every hunter and fisherman can do his part in helping solve the food problem by preventing waste. Waste is always criminal, but it is doubly so at the present time. The man who kills a deer far from camp and is too lazy to see that the whole carcass is used for food, should be subject to fine and imprisonment. By salting part of a limit catch of fish all can be used as food.

It is to be hoped that every hunter and fisherman in the state will take sufficient interest in "preparedness" to see that every deer and duck shot, and every fish caught, is utilized for food. In so doing it will make possible the shipping of other foodstuffs from this country to the allies.

WILD LIFE AND FOOD.

The necessity for an increased food supply is turning the attention of everyone to the prevention of waste and the further utilization of undeveloped resources. Not only are methods of increasing crops being studied, but also methods of utilizing such natural sources of food supply as fish and game. An important committee, working under the direction of the Council of Defense, appointed by Governor Stephens, has as its problem the better utilization of the natural food supply represented in the products of the sea and of the game covers. The committee is composed of Dr. Barton W. Evermann, director of the California Academy of Sciences, chairman; Professors Kofoid and Ritter of the University of California, Professors McFarland, Snyder and Starks of Leland Stanford Junior University, W. C. Crandall of the Scripps Institution for Bilogical Research, N. B. Scofield and Dr. H. C. Bryant of the Fish and Game Commission.

This committee plans to study every angle of the problem. In the first place, an inventory of the natural food resources of the land and sea, including deer, ducks, fishes, mollusks and crusta-

ceans, will be taken in order to determine what species and what amounts are used at the present time or can be used each year. Then a study will be made of those fishes, birds and animals not now used, but which might be utilized as food, and ways will be devised for educating people to the value of new products of the land and sea and means of marketing the same by some cooperative method. Although 100,000,000 pounds of fish were marketed in this state during 1916, yet we have not yet fully utilized our fishery resources. annual catch of fish and the take of game so that an inventory of the natural food resources of the state may be at hand. This is just the kind of data that has been collected by the Fish and Game Commission and all of it will be placed at the disposal of the committee.

The Department of Commercial Fisheries of the commission has been investigating the fishing methods employed and the methods of canning and curing. Furthermore, detailed information concerning the commercial fisheries has been

Fig. 41. Exhibit of "Common Mammals of the Forest" prepared for the Forest Service when in district convention at Berkeley, January, 1917. This is one type of the educational work being done by the Bureau of Education, Publicity and Research.

We kill 12,000 deer each year, but a large part of the venison so obtained is not properly utilized. The same can be said of the hundreds of thousands of ducks and geese killed each year. One of the serious problems of the committee will be to study means of preventing waste.

The California Fish and Game Commission, in whose hands is placed the administration of the wild life resources of the state, has been collecting data as to the abundance and yearly take of the various species of fish and of game. These data are of great importance at the present time. The committee on scientific investigations working under the Council of Defense is anxious to obtain information on the amount and value of the collected with the ultimate object of aiding in the development of latent fishery resources and at the same time conserving the marine species upon which these industries depend. A law enacted at the last legislature requires dealers and handlers of fish to make an accurate monthly statement of the quantity and varieties of fish handled and of where they were caught. These data not only show the actual catch from month to month, but also the decline and rise of any fishery and the season of each variety of fish. The information now available on fish marketing problems, the sanitary handling of fish by fishermen and by markets, the cold-storaging of fish, the utilization of fish waste for fertilizer or for chicken feed will be of great service

in solving the food problem confronting the nation in this crisis.

Similarly, the Fish and Game Commission has made available through its game research department statistics on the annual kill of deer, rabbits, ducks, geese and other game. Data on the shipments, on the amounts sold in the markets, and on the wholesale and retail prices have also been obtained. Consequently, the Council of Defense has at its disposal many of the necessary facts and figures necessary to launch the scientific investigations.

The Fish and Game Commission is cooperating with the committee on biological investigations even to the extent of detailing certain men to devote most of their time to work which will be a direct aid to the committee. A wider and more efficient utilization of the fish and game resources of the state for food can be expected.

THE COST OF FISH AND GAME CONSERVATION.

The California Fish and Game Commission has sometimes been called extravagant because of the sums of money spent in administering fish and game resources. When such criticism is made the person forgets the fact that California is a very large state and that a very large portion of the funds received from the sale of hunters' and anglers' licenses must be utilized in properly patroling the state. California is 3.2 times as large as New York. New York employs a much larger number of wardens than we do and pays them smaller salaries. In addition to the administrative expenses of the department, included in another sum, New York spent during the fiscal year ending September 30, 1912, $287,081.99, a sum in itself about equal to the total spent in a state over three times as large. If you are not convinced that the administration of a resource bringing in an annual income of millions of dollars needs the sums invested, read the biennial report of the commission, and note the summaries of convictions, number of fish reared in the hatcheries, and the results of the other activities.

AN ALIEN FIREARMS BILL.

There was introduced in the 1917 legislature a bill prohibiting the ownership or possession of firearms, or the sale thereof, to any unnaturalized foreign-born resident of the state of California. In spite of the fact that a similar law exists in Pennsylvania and several other Eastern states, where it has been found valuable, it failed of passage. Had this measure been passed, two things could have been expected: first, there would have been fewer violations of the game laws, and second, there would have been fewer murders. Records of the Fish and Game Commission show that nearly half of those arrested for violation of the game laws are aliens. For example, the number of arrests of native born and aliens between July 1, 1916, and December 31, 1916, was as follows:

Native born	238
Alien born	181
Nationality undetermined	42
Total	461

A search of the criminal records would show that a large percentage of the murders occurring in this state can be attributed to aliens. Certain it is that those deputies of the Fish and Game Commission that have been shot down while doing their duty have almost invariably been killed by aliens. A bill which would have meant much to fish and game, and one which would have greatly reduced the number of murders committed in California, failed of passage.

BOYS INJURE FISHING.

Heretofore, many small boys who have begun fishing before the opening of the season have escaped prosecution on account of their tender years. It has now been found that many streams have been almost depleted by small boys before the legal opening day. Not only do these boys fish before the season opens, but many of them are guilty of exceeding the bag limit.

During the latter part of April, Deputy Henry Lencioni arrested Fred Mason and Claude Congleton, aged eleven and twelve years, respectively, on Mill Creek, in Sonoma County, for having in their possession a total of 163 trout. The fish were confiscated and the boys will be prosecuted.

Such occurrences are not uncommon. It is needless to say that they can not be tolerated and parents of young boys

who are violating the law are warned to take notice of this decision on the part of the officials having in charge the enforcement of the fish and game laws.

BIRD FOUNTAIN DEDICATED.

An event which marks a new interest in bird life of California was the dedication last June of the new St. Francis fountain on the boundary of Riverside and San Diego counties. This fountain, which was dedicated as a perpetual drinking place for animals and birds, was secured largely through the efforts of the Landmarks Club and the Riverside Humane Society, although it is a part of the municipal bird sanctuary surrounding Mt. Rubidoux. The fountain is a beautiful piece of architecture and the first of several similar works which the Landmarks Club proposes to erect in various parts of southern California.

Today, the two hundred and fifty acre tract on which rises Mt. Rubidoux, world-famous for the annual Easter Sunrise Service held on its summit, is a bird sanctuary. Its hitherto treeless soil now nourishes 50,000 young trees. California has more than five hundred varieties of birds and thousands of them may here nest and live unmolested and unafraid.

And that their needs may be still further supplied the western lower slope of the mountain has been artificially supplied with a stream of clear, sparkling water. Down, down the rivulet trickles—now a misty foam, now overflowing a pool. Again, a deeper hole is filled, and always the primary purpose of providing drinking and bathing places for the wild birds is carried out.—*Our Animals*, March, 1917.

Fig. 42. Feeding time at the State Game Farm, Hayward, California. Photograph by W. N. Dirks.

FIVE MEASURES FOR INCREASING GAME.

At the annual meeting of the American Game Protective Association recently held in New York emphasis was placed on five principal measures on which the

country must chiefly rely for bringing back its game. They are:

1. A thorough organization of the sportsmen.

2. The setting aside of areas in rural districts in which game will be inviolate, thus preserving the seed stock.

3. The breeding of game in captivity.

4. The provision of food, particularly in winter.

5. Systematic warfare on vermin.

THE USE OF THE LICENSE FUNDS.

During each session of the legislature envious eyes are cast on the fish and game protective funds. There appear to be certain men who wish to take over part of the funds furnished by the hunters and fishermen of the state to be used for good roads or for other state purposes. No one who has studied the situation can possibly see justice in any such move. Funds for the conservation of fish and game are furnished by those who make the most out of that natural resource and they will carefully guard the treasury to see that every cent of money so contributed is used for the protection and increase of those birds, animals and fish hunted for food and for sport or those of economic value. If the money secured by the sale of hunting and fishing licenses is not being properly used, recourse can be taken to improve conditions. However, so long as funds are raised by means of a special tax, they must be used for a specific purpose.

WINTER vs. SUMMER FURS.

Mr. E. R. Skinner of Sacramento, the largest fur buyer on the Pacific coast, recently stated that last year he paid $2.50 for the pelts of five fishers killed during July near Placerville, California. The trapper thought he was badly treated to receive but $2.50 for the five furs. When Mr. Skinner tried to sell these furs, the buyer threw out two of them as being of no value and paid fifty cents apiece for the other three. Mr. Skinner therefore lost one dollar in the operation. He stated that these same fishers if they had been trapped in winter, would have been worth, at the least calculation, $200. Is this not convincing evidence of the need for protective laws for the fur-bearers during the summer when their fur is of no value?

A trapper's license law passed by the 1917 legislature goes into operation in August. The law requires a license costing one dollar of every person trapping furs for profit and at the same time protects the more valuable fur-bearers during the summer when the fur is of no value. A further provision requiring a report of the number of fur-bearing mammals taken will furnish a basis for additional conservation measures.

DISCONTINUE PRIZES FOR FIRST DEER OR FIRST LIMIT OF FISH.

For several years past a number of valuable prizes have been offered by sporting goods houses in Los Angeles for the first deer of the season, and for the first limit of fish. The incentive to win these prizes has often been the cause of violation of the law. The beginning of the fishing season this year witnessed the arrest of a man at Bear Lake, San Bernardino County, who had attempted to secure a limit by unfair means. The sporting goods houses concerned, now convinced of the dangerous incentive to break the law given by the offering of such prizes, have decided to discontinue them.

HIGHER BOUNTY TO BE PAID ON MOUNTAIN LIONS.

The relatively small kill of lions during the past few years and the constant complaint by lion hunters that the bounty was insufficient to make the lion hunting worth while has led the Fish and Game Commission to increase the bounty on female lions from $20 to $30. The new bounty will be in effect after July 1, 1917. All claimants for the bounty will be required to send in the entire skin of the animal with the evidence of sex attached. In cases where the sex can not positively be determined, only $20 will be paid.

It is hoped that this increase of bounty will develop sufficient incentive to so control the number of mountain lions that their effect on deer will be negligible.

RESULTS OF COYOTE DESTRUCTION.

The recent campaign for the extermination of rabid coyotes in Modoc and Lassen counties waged during 1916 by the Forest Service, the California State Board of Health, the Federal Health Service, and the Biological Survey resulted in the destruction of 2,707 coyotes and 178 wild-

cats. In addition, county records show that during the same period bounties were paid on 1,474 coyote scalps. Figures compiled by the State Board of Health indicate that 362 head of cattle, 39 head of horses, 233 sheep, and 18 swine died from rabies or suspected rabies during this period. Hundreds of head of stock found dead are also supposed to have died from rabies, but proof was not positive. Laboratory examination of the brains of 127 domestic and wild animals gave positive tests of this disease.—*Weekly Bulletin of Forest Service*, Feb. 24, 1917.

Fig. 43. The deer season opens on August 1 in Districts 2 and 3, two weeks later in other districts. Bucks with branched antlers alone can be shot. Photograph by W. N. Dirks.

PELTS PROVE VALUABLE.

Coyote pelts are worth $8 each, for fur, as well as $2 bounty, in Tulare County. J. C. Frazier, of Tipton, appeared at the Tulare County Court House recently with 51 pelts, to collect his bounty. He also stated that he had a market for all the pelts he could get. The pelts were tanned and ready for shipment and were worth over $300.

Eastern furriers have found that the pelts, after they are dyed, make splendid substitutes for some of the more expensive furs, as the hair is firm and of good length.—*The Joaquin*, March, 1917.

HOW TO DRESS A DEER.

Under ordinary circumstances a deer should be dressed on the spot as soon as killed, as this insures that there will be no bloating, and also makes possible thorough bleeding. Do not cut the deer's throat.

My method is based on the presumption that the work will be done by one man. By following it the danger of getting hair and foreign substances will be minimized. Remove all blood with a dry cloth, never use water, which hastens decomposition:

1. Place the carcass in a slight depression on the side. Roll your sleeves to the shoulders and pin them up.

2. Lift tail and make an incision completely around the anus with a sharp knife, cutting through to abdominal cavity.

3. Grasp posterior end of large intestine released by this incision with one hand (by wrapping a piece of cloth around the intestine a better grip will be secured) and pull it far enough out to tie a string about its end. Some additional cutting will probably be necessary as the intestine is pulled out. The object of this operation is to keep the carcass from being fouled during subsequent movements.

4. Turn carcass on back and, standing astride of it, with legs just back of the shoulders and facing the tail, make an incision from the median line adjoining the thorax large enough to admit two fingers. With a knife placed between the index and adjoining finger make a clean, straight cut down the median line to a point within approximately four inches

of the root of the tail. In this operation the fingers are employed in holding up the wall of the stomach so that the knife will not cut the paunch or entrails.

5. Turn carcass on side. Grasp it by tail and neck or horns and pull it out of depression, so that paunch and entrails will fall into spot formerly occupied by the carcass. The organs must be cut loose with a knife, but care should be taken not to perforate them.

6. Remove diaphragm by cutting around outer edge. Next remove the œsophagus by severing as near to the upper end as possible. Heart and lungs will come with the œsophagus, as they adhere to it. This completes removal of internal organs. Sweep out collected blood with palm of hand.

7. Hang carcass by head or horns. This is difficult for one man to do if the deer is large, and in most instances help will have to be secured. It is better to do the hanging in a shed where there is a draft, than in the woods.

8. Place a skewer to keep the incision open and permit escape of body heat. Cover whole carcass with mosquito netting, cheesecloth, or burlap, in warm weather when flies are present. When *rigor mortis* sets in, the body heat is gone and the carcass is ready for shipment.

9. To prepare for shipment examine mouth, nostrils, eyes, and bullet holes for eggs of flies. Sew up carcass with sail needle and light twine, taking care to close vent and all bullet holes. If the state law requires it, affix tag to carcass and comply with all other legal requirements. If the weather is moderately cool and the shipment will not be more than twenty-four hours, icing is not necessary. If the temperature exceeds sixty degrees the carcass should be partly filled with lumps of ice varying in size from a lemon to a large orange. This is done, of course, before sewing up. Weigh carcass before putting in ice. Shipping tags are attached to horns or to a slit in the ear. All shipments should be made by express.—JOHN B. BURNHAM in *American Game Protective Association Bulletin*, May 1, 1917.

THE HUNTING INSTINCT.

To insist that all hunting and killing of game birds is wrong is to maintain that one of the most deeply planted instincts of the masculine human nature is a perversion. The primitive races of men found their means of livelihood largely through hunting, and success in life was conditioned upon strength, endurance and skill in the hunt. A large majority of perfectly normal boys still, and perhaps ever will, pass through a period of their individual development when the hunting instinct is dominant and must be properly directed or gratified if the boy is to develop those hardy, alert and vigorous qualities which are of prime importance in the making of a man. Annually thousands of mature men, weary and worn by the strenuous and often unnatural toil of modern civilized occupations, find in the pursuit of game birds the allurement which leads them to forsake business for a few days and betake themselves to the health-giving influence of woods and fields. Here in the haunts of the game birds, in contact with the elemental forces of nature, engaged in a pursuit which requires vigorous physical activity and absolute forgetfulness of other affairs for success in the sport, they find relaxation, rest and recuperation.

Much of the dispute associated with hunting and hunters has arisen through the disregard by some thoughtless or inconsiderate men of the property rights of those on whose land they are hunting and through a failure to restrain their immediate self-interest for the larger good of the community. Men must learn to be content with a reasonable bag of game, at least with that number which corresponds with the consensus of public opinion as indicated by the legal limit. Men may learn that the pleasure and benefit to be derived from the hunt are not conditioned upon unlimited slaughter, but rather upon the associations and enjoyment of natural surroundings which the hunting season affords. Many boys and men have learned that even great pleasure and benefits may be derived from the study and photographing of the living birds, because of the much higher degree of hunting and stalking skill required, because of the larger opportunity which this affords for real acquaintance with the bird and its habits and the even more attractive and valuable trophies which they have to show.

A public-spirited, far-sighted policy requires that the splendid natural resources be maintained not only for the enjoyment of the present generation but passed on

unimpaired to succeeding generations so far as this is possible in civilized communities and consistent with agricultural interests. Here again there is the great need for the development of an enlightened public sentiment so that as individuals and communities we shall neither exercise nor tolerate that spirit of unlimited destruction of game which has led to the practical extermination of game in many places and is so seriously reducing the numbers of many of our game birds, but rather devise ways and means to increase and perpetuate them.—*The Extension*, Nov., 1912, Vol. 6, No. 11. Guide for North Dakota Bird Study, pp. 5–6.

DEEP SNOWS CAUSE STARVATION OF MANY YELLOWSTONE ELK.

Alarming reports of conditions which threaten decimation of the Yellowstone elk herds are beginning to reach the Department of Agriculture, both from the Jackson's Hole region and from Gardner, Montana. The danger is said to be due to an exceptionally heavy winter snowfall and late oncoming of spring. Deep crusted snow is preventing the elk from obtaining their usual feed and the weakened animals, especially the calves, are reported to be dying rapidly in spite of the large supply of hay provided by the federal government for such emergencies. This supply, however, has been exhausted.

The elk which winter around Jackson's Hole, in Wyoming, are known as the southern or Jackson's Hole herd and number more than 20,000. The northern or Park herd is estimated by the Park authorities to contain over 30,000 animals. According to the reports received by the Forest Service the losses in the southern herd may reach even as high a figure as one-third the entire number, with practically an entire loss of last year's calves. In the northern herd conditions appear to be less critical, but an immediate spring break-up is eagerly hoped for by those interested in seeing the elk preserved.

"When I left Gardner about three weeks ago," said Charles Sheldon, the explorer and naturalist who was selected by the government to represent the sportsmen in the elk census attempted this spring, "the elk that I saw seemed on the whole not in bad condition for this time of year except the calves, many of which were pretty weak. But the snow was unusually deep and the elk widely scattered in search of food. I understand it has been snowing since I left and that considerable losses are thought probable. The winter has been extremely severe and both elk and domestic live stock are bound to suffer under such exceptional conditions. Because of the depth of the snow it was impossible to make the elk census that we had planned.

"Ordinarily there isn't enough snow to prevent the elk from getting at their feed. This winter, however, a succession of storms has piled the snow up, with the result that the animals have become weakened by prolonged starvation. At Jackson's Hole the Biological Survey had over 600 tons of hay available for feeding the elk, but I understand the supply is now exhausted.

"In most places feeding the elk is out of the question. Hay costs around $40 a ton and it is almost impossible to get hold of any at that price. The cattle and sheep men are unable to secure enough to feed their stock and will, I am told, probably suffer heavy losses. Even if unlimited amounts of hay could be had there would be no way to get it to the elk, since the roads are impassable."

Officials of the Department of Agriculture point out that, deplorable as are the losses which the elk herds are now suffering, the situation is not essentially different from that created among domestic live stock by seasons of unusual severity. The natural increase will, they say, gradually bring the herds back to their former size if they are properly protected. Both the Forest Service and the National Park Service are deeply interested in the perpetuation of the elk, and are working together in an effort to find a consistent, workable conservation policy.

THE FIELD THAT SILAS PLOWED.

This is the field that Silas plowed.

This is the corn that grew in the field that Silas plowed.

This is the bug, prolific and smug, that destroyed the corn that grew in the field that Silas plowed.

This is the bird of joyful song, that ate the bug, prolific and smug, that destroyed the corn that grew in the field that Silas plowed.

This is the cat, stray and forlorn, that killed the bird of joyful song, that ate the bug, prolific and smug, that destroyed the corn that grew in the field that Silas plowed.

This is the field that Silas plowed—deserted by birds of joyful song, swarming with bugs, prolific and smug, yielding but half a crop of corn, roamed by the cat, stray and forlorn.—*The Conservationist*, February, 1917.

NATURE STUDY OUTLINE FOR ELEMENTARY SCHOOLS.

In an endeavor to furnish the nature study teacher with a useful outline of work for the whole year, Miss Gretchen L. Libby, supervisor of nature study in the public schools of Santa Barbara, and formerly educational assistant for the California Fish and Game Commission, has published a bulletin of 26 pages. Miss Libby has had wide experience in nature study work and her contribution to the teachers of the state when connected with the Fish and Game Commission has been widely used. The edition of this publication, "Bird Study in the Public Schools," has long since been exhausted, and it is fortunate that there can now be recommended a valuable substitute. The purpose of nature study is thus defined in the introduction:

"(1) To arouse an interest in the out-of-doors, and to lead the children to a first-hand knowledge of the common forms of plant and animal life as seen about them. (2) To develop a sympathy toward nature, and a regard for the value of life. (3) To train the powers of observation, and to teach the children to observe accurately. (4) To lead them to see the interrelation of plant and animal life, and its economic value to man. (5) To guide the pupils into a feeling of comradeship with nature, which will furnish them with a wholesome and healthful means of spending their leisure hours."

The outline is arranged in such a way that definite work is suggested for each grade and for each month in the year. The subjects covered are correlated with the time of year. Caterpillars are to be studied when they can be obtained. Winter birds are to be studied when they are present in number. The living things associated with Thanksgiving are studied in November, and the work for December is grouped about Christmas and its festivities. Studies of plant life, of animal life and directions for field work are included in the work of each month. Suggestive outlines for special study and a fine list of references are appended.

Fig. 44. Exhibit of bird boxes and winners of contest held by Playgrounds Department of Berkeley, California. Such contests as this stimulate interest in bird study. Photographs by T. J. Storer and G. Schneider.

THE REAL SPORTSMAN.

Among sports and pastimes, hunting, shooting and fishing are considered the world over, as being most desirable and suitable forms of recreation, and for centuries past have provided healthy exercise, pleasure and profit for all classes of people. The real sportsman who believes in legitimate hunting within reasonable limits, and who, for success, depends upon his own skill, courage and endurance, is invariably a true gentleman in every sense of the word. Included in this class are some of the greatest and best men who have ever lived, and among them are those to whom the world will everlastingly owe debts of gratitude for valuable services rendered to humanity. Most of the world's famous scientists, explorers, missionaries, statesmen, educators and other prominent men, were renowned in their day as fearless hunters, keen sportsmen, or excellent anglers.

The true sportsman is possessed of a natural love or inclination for hunting, shooting and fishing, and he is not influenced by selfish interests, mercenary motives, personal gain or commercial considerations. The best class of sportsmen are always in favor of game protection and the enforcement of reasonable game laws. They cheerfully comply with the hunting regulations themselves, and realize that it is impossible to frame laws that will suit all parties and all sections. Above and beyond all, the real sportsman is in favor of giving the wild birds some kind of a fair show, and a square deal, for he well knows that they are at a great disadvantage, not only in the field, but also on account of not being represented when bird and game laws are being considered, or when bag limits and open and closed seasons are being discussed. The success or failure of our game protection laws depends largely on the kind of men behind the guns. Law or no law, the right minded sportsmen, old and young, do not need restrictive legislation to control their actions, or regulate their hunting and fishing methods, and there would be no need of game wardens, if the majority of so-called sportsmen were earnestly and honestly in favor of game and fish protection and preservation.—H. P. ATTWATER, *Bull. Sci. Soc. of San Antonio*, Vol. 1, pp. 56-57.

BOTS WANTED.

The Bureau of Entomology is prosecuting, under the immediate direction of Dr. C. H. T. Townsend, a detailed investigation of bots of American large game animals, and especially of those which occur in the head and throat. The latter have been found in the nasal and frontal passages, pharynx, larynx and gullet of deer, wapiti, caribou and pronghorn; and there is a possibility of their occurrence also in moose, mountain sheep, mountain goat and even musk ox. The greatest service can be rendered in this connection by persons who have opportunity to examine freshly-killed carcasses of any of the above animals. Material is desired from every section of North America.

The flies which are the parents of these bots are very rarely seen and are but little known even to entomologists. They can be reared from the mature bots by exercising proper care. The best chance of finding mature bots in game heads appears to be in winter or early spring. Such bots should be packed alive in loose dry earth in strong tin or wooden receptacles, the package being well wrapped in several thicknesses of stout paper and firmly tied, or sewed in cloth or canvas, before mailing. This office will make every effort to rear the flies from such sendings.

If bots are found which do not appear to be mature, they may be dropped in spirits in a wide-mouthed bottle, packed in a strong receptacle with cotton or other yielding substance, and mailed. Such material is needed for study purposes. If any bots should be found beneath the skin, in the stomach or intestines, or in any other part of the body, they will be equally acceptable.

Assistance rendered will be greatly appreciated and duly acknowledged in reports that may be published on the material secured. Each lot of material should be accompanied by the following data:

(1) Locality where host animal was killed.

(2) Name of host animal.

(3) Part of body in which found.

(4) Date of securing the material.

(5) Name of collector.

—L. O. HOWARD, Chief of Bureau of Entomology.

HATCHERY NOTES.

W. H. Shebley, Editor.

PROSPECTS GOOD FOR A RECORD TAKE OF EGGS.

With the completion of the spawning operations at Brookdale and Snow Mountain stations, prospects for a record take of eggs are excellent. A total of over 20,000,000 eggs has been taken, to date, and egg collecting operations at the Rae Lakes egg collecting stations have not as yet been commenced.

MT. SHASTA HATCHERY.

Of the 6,000,000 quinnat salmon fry handled at Mount Shasta Hatchery this season, approximately 2,500,000 have been planted in the Sacramento and Klamath rivers. The balance have been transferred to either the large salmon rearing ponds or to the lakes at Mount Shasta Hatchery, where they will be held until after the first fall rains, when they will be planted in the upper reaches of the Sacramento and Klamath rivers.

The take of rainbow trout eggs at the auxiliary stations on the Klamath River was very satisfactory, and the fry resulting from the eggs taken will amount to about 2,500,000. Rainbow eggs will be shipped to Mount Shasta Hatchery from the egg collecting stations at Domingo Springs.

Black-spotted trout eggs from the Tahoe Hatcheries and steelhead eggs from Brookdale and Snow Mountain stations are being hatched at Mount Shasta Hatchery for distribution in the different sections of the state.

The 3,000,000 Loch Leven and eastern brook trout fry are doing nicely and are about ready for distribution. In all, approximately 11,000,000 trout fry will be shipped from Mount Shasta Hatchery this season.

TAHOE HATCHERIES.

Although the spawning season for the black-spotted trout in Lake Tahoe was very late this season, and it appeared at one time that the take would be short, reports now indicate that the season's take of eggs will be in excess of four million. All egg collecting operations are being carried on at the Tallac Station. A portion of the eggs will be shipped to Mount Shasta Hatchery and the new Mount Whitney Hatchery. About 250,000 rainbow eggs will be shipped to the Tahoe City Station from the Domingo Springs Station and the resulting fry will be distributed in streams and lakes of the Tahoe region. Black-spotted trout eggs will be hatched at both the Tahoe City and Tallac stations for distribution in the streams tributary to Lake Tahoe, as well as other streams and lakes of the Tahoe region. Streams of Alpine County will also be stocked with black-spotted fry from the Tallac Station.

FORT SEWARD HATCHERY.

All of the quinnat salmon fry were distributed from the Fort Seward Hatchery during the month of March. The fry were planted in Mad River, in tributaries of Humboldt Bay, and in Eel River and tributary streams.

Steelhead trout eggs to the number of 1,350,000 have been shipped to Fort Seward Hatchery from the Snow Mountain Station.

We are planning to ship approximately 150,000 rainbow trout eggs from Domingo Springs Station to Fort Seward Hatchery during the month of June. Both the steelhead and rainbow trout fry will be given a wide distribution in the streams of Humboldt County. It is also planned to stock a few streams in Del Norte and Mendocino counties from this station.

ALMANOR HATCHERY.

Egg collecting operations were commenced at the Almanor Hatchery on about March 1 and continued throughout the months of April and May. Owing to the fact that an average of nearly 600 second-feet of water was run through the spillway of the Almanor dam by the Great Western Power Company almost continuously during the spawning season, the volume of water passing through our fish racks was such that it was impossible for the spawning fish to ascend the stream. Only a half million eggs were taken at this station. However, the run of spawning fish is later in Rice Creek where the Domingo Springs Station is located, and our crew is making every effort to obtain enough fish to give

us an average take of eggs. The Domingo Springs egg collecting station is operated as an auxiliary station to Almanor Hatchery. At this date, June 1, the run of female trout predominates ten to one over the males, owing to the fact that there was such heavy fishing below our racks since the opening of the fishing season on May 1. The male fish enter the spawning streams first and consequently a greater proportion of the males were caught by the anglers.

SNOW MOUNTAIN STATION.

Snow Mountain Station was closed on May 30, after completing a very successful season's work. Although it appeared during the fore part of the season that our operations would be a failure, owing to adverse conditions of weather and water, the fish ran well during the latter part of the season, and in excess of six million trout eggs were taken. A quarter of a million eggs were hatched and the fry resulting were distributed in tributaries of the Eel River. The balance of the eggs were "eyed" and shipped to Ukiah, Mount Shasta, Fort Seward and Mount Whitney hatcheries, where they will be hatched and reared for distribution in the waters in those sections of the state where conditions are favorable for steelhead trout.

UKIAH HATCHERY.

A half million steelhead trout eggs were shipped from Snow Mountain Station and Ukiah during the latter part of May. The fry resulting from the same are doing nicely, and, when ready for planting, will be given a wide distribution in the streams and lakes of Mendocino, Sonoma and Lake counties.

BROOKDALE HATCHERY.

All egg collecting operations have been completed at the Scott Creek Station. This station produced a little over two million steelhead trout eggs this season. Approximately 900,000 eggs were hatched at Brookdale for distribution in the streams of Santa Cruz and Santa Clara counties, and the balance were "eyed" and shipped to Mount Shasta Hatchery, from which station the resulting fry will be distributed.

The eggs retained at Brookdale Hatchery hatched out well, and the first of the fry are now being distributed in the streams of Santa Cruz County.

BEAR VALLEY HATCHERY.

Bear Valley Hatchery was opened up during the fore part of March, and the fish commenced running into North Creek about the tenth of April in great numbers. Owing to the rising of the waters of Bear Lake about seven feet higher than in former years, which practically shut out the spawning fish from all other streams tributary to the lake, the fish congregated at the mouth of North Creek and entered the stream in large numbers. Facilities for holding eggs at our spawning station are limited and when the hatching troughs were filled, we were unable to take more eggs. A million eggs were taken, and after "eyeing" were transferred from the "eyeing" station to the hatchery where they will be reared for distribution in the waters of San Bernardino County.

MOUNT WHITNEY HATCHERY.

The work of preparing Mount Whitney Hatchery for fish-cultural operations is now nearing completion, and everything is in readiness for the season's work. From Snow Mountain Station, 750,000 steelhead trout eggs have been shipped to the hatchery and a consignment of 250,000 black-spotted trout eggs from Tahoe Hatchery will be shipped in a few days. These eggs will be hatched and the fry reared for distribution in the waters of southern California.

During the latter part of June or early in July when it is possible for our assistants to get through the Oak Creek pass, the Rae Lakes Egg Collecting Station will be opened up and it is expected that enough rainbow trout eggs will be collected to fill the Mount Whitney Hatchery to capacity.

WAWONA HATCHERY.

On May 11, the Wawona Hatchery, located near Wawona, Yosemite Valley, was opened up, after being closed since August, 1914. On May 17, a shipment of rainbow trout eggs was received from Mount Shasta Hatchery. The fry resulting from these eggs will be reared for distribution in the Merced River and other streams of that section of the Yosemite Valley.

FISH DISTRIBUTION.

The application list for the season of 1917 was closed on May 31. All fish available for distribution this season have been allotted, owing to the fact that so many applications were received from all sections of the state that it was not possible to carry any surplus supply at any of the hatcheries.

Distribution car No. 01 is now in the Southern Pacific shops at Sacramento for a general overhauling before commencing the season's work. It will leave the shops on June 9, and about June 15 will commence the distribution of trout fry from Mount Shasta Hatchery.

Distribution car No. 02 is being equipped for distribution work and is expected to be out of the shops about the middle of June, when it also will be put into service distributing fry from Mount Shasta Hatchery.

Fig. 45. View of new Mount Whitney Hatchery, showing tower. Photograph by J. L. Von Blon.

SCREEN AND LADDER SURVEYS.

Preliminary surveys have been made in the delta region for the installation of screens over the hundreds of siphon pumps now operated in many of the large

reclamation districts of that section. Considerable difficulty has been experienced in locating the owners of the different siphon plants, but recently procured charts give almost complete data relative to the location of the different reclamation districts and the owners of the majority of the large holdings in that section. A survey of a portion of Shasta County has been made, and efforts are being made to have all of the ditches and canals screened this summer.

Reports recently received from Modoc and Trinity counties indicate that the installation of screens is proceeding satisfactorily. Surveys of the installation of fishways in Napa, San Luis Obispo and Sierra counties are now under way and it is hoped that all fishladders will be completed by fall.

COMMERCIAL FISHERY NOTES.

N. B. Scofield, Editor.

THE FISH INDUSTRY IN CALIFORNIA DURING THE YEAR 1916.

For the year 1916 the wholesale fish dealers, packers and canners of California reported the receipt of 110,652,626 pounds of fish received from fishermen and fish taken by themselves. At an average price to the fishermen of four cents per pound, this would represent a value of $4,426,105.04. There were 3,820 fishermen employed in catching fish during 1916, and the fishing boats used in the state fisheries were as follows: Boats transporting and collecting fish from the fishermen numbered 59 (all under 15 tons); boats fishing under five tons numbered 1,917; boats fishing over 5 tons and under 15 tons numbered 146; boats fishing over 15 tons and under 50 tons numbered 15, making a total of 2,137 boats and representing an investment of $2,445,710. The number of nets used by the fishermen, including all kinds, was 8,275, representing an investment of $620,729.

During the year 1916 there were, along the California coast and the inland waters, 101 fishery plants operated by wholesale dealers, packers and canners who either caught their own fish or received fish direct from the fishermen (dealers who received fish from wholesalers not included in this report, only wholesale dealers, packers and canners who either caught the fish themselves or received fish from fishermen). Seventy-one of these plants were operated by wholesale dealers, who furnish the trade with fresh fish, and 30 of the plants were canning and packing establishments where fish were canned, pickled, cured, salted, smoked or dried. There was invested in these plants $2,008,004, of which $1,348,647 was invested by the canners and packers and $695,357 was invested by the wholesale fresh fish dealers. There were 3,967 people employed in these plants, not counting the fishermen. Three independent reduction plants were operated in the state during 1916; that is, plants that were not operated in conjunction with canneries or packing establishments. These plants represented an investment of $107,000 and employed 62 people throughout the year.

Fish Canned.

The canned fish pack for 1916 was as follows: Tuna (albacore), 108,312 cases one-pound cans, 299,035 cases half-pound cans, 54,113 cases quarter-pound cans; deviled or potted tuna, 3,430 cases half-pound cans, 14,679 cases quarter-pound cans; tuna chowder, 1,000 cases (No. 1 Eastern oyster); sardines, 108,408 cases one-pound cans, 50,272 cases half-pound cans, 13,445 cases quarter-pound cans; salmon, 18,720 cases one-pound cans, 23,016 cases half-pound cans; shad, 27,167 cases one-pound cans; shad roe, 7,244 cases half-pound cans; bonito, 155 cases one-pound cans, 5,169 cases half-pound cans, 930 cases quarter-pound cans; yellowtail, 11 cases one-pound cans, 810 cases half-pound cans; mackerel, 133 cases one-pound cans, 3,035 cases quarter-pound cans; herring, 7,223 cases pound cans; anchovies, 201 cases quarter-pound cans; sea bass, 62 cases half-pound cans; miscellaneous fishery products, 1,182 cases half-pound cans, 856 cases quarter-pound cans; abalone, 5,880 cases one-pound cans.

Fish Salted, Smoked, Pickled and Cured.
(Net Weight).

Salmon, mild cured, 2,024,584 pounds; salmon, hard salted, 4,000 pounds; an-

chovies, pickled, 625,000 pounds; shad, mild cured, 241,080 pounds; sardines, salted, 244,600 pounds; herring, pickled and cured, 188,200 pounds; tuna, salted, 19,000 pounds; tuna, smoked, 27,414 pounds; tuna, cured in oil, 2,000 pounds; tuna, frozen, 65,205 pounds; rock fish, salted, 18,845 pounds; barracuda, salted, 12,000 pounds; rock bass, salted, 3,000 pounds; sea bass, salted, 5,000 pounds; Spanish mackerel, salted, 19,000 pounds; yellowtail, salted, 8,000 pounds; bonito, salted, 1,000 pounds; miscellaneous fish, salted, 223,396 pounds.

Chicken Food, Fish Scrap, Fish Oil, Etc.

Fish oil, 32,082 gallons; fish scrap, chicken food and fertilizer, 4,494,136 pounds.

CIOPINO.

The ciopino (pronounced chipeno) is one of the simplest, healthiest and cheapest ways of cooking fish. Originated by Italians, it is cooked and eaten by them almost exclusively.

Ciopino is a great dish among the fishermen, some practically living on it because of its healthfulness and muscle-building qualities, and the ease with which it is prepared. When fishermen are out on trips for days at a time the only supplies that are taken are bread, wine, a little coffee and the ingredients that are used to make up a ciopino, depending on their luck to catch the needed fish. Butter is never used in the preparation of the ciopino, olive oil taking its place. There are a great many kinds of ciopino; that is, most of the people that cook it prepare the dish in a slightly different way. Sometimes it is what one might call fancy, shellfish, celery, parsley, wine, etc., being used in preparation. But the kind generally prepared by the fisher folk is very simple and inexpensive, the olive oil used being the most expensive ingredient. Some prefer salad oil, which is less expensive and not quite so rich. The large sized fishes are generally used in making the ciopino on account of the size of the bones. Most any of the larger sized ocean fishes, such as the rock fishes, rock bass, sea bass, halibut, and barracuda, can be used. The wings of the skate are highly prized among the Italian fishermen for a ciopino; striped bass are very fine. Several different varieties of fish are sometimes used. The ciopino is neither a roast, chowder nor a fry. In America, it would probably be nearer a pot roast than anything else. In preparing a ciopino the whole fish is used including the head, which contains some of the best part of the fish.

Ciopino, such as is made by the fishermen, is prepared as follows:

> For five people use from three to five pounds of fish sliced in fairly large pieces, then prepare one or two onions, depending on size, by chopping them up quite fine. Place in a stewpot one half cup of olive oil (salad oil may be used) and add the onions, frying them until yellow, in the meantime adding several cloves, garlic, and a little parsley. Add a can of tomatoes (raw tomatoes may be used) and cook for about ten minutes. If potatoes are used (a great many never use potatoes in the preparation) they should then be added and cooked for five or ten minutes. Add fish, covering it well with the tomatoes, onions, etc., season with salt, and rather highly with pepper or paprica, put on the lid and let simmer until done. Don't stir. A little water may be added if desired. Serve in a deep plate. Ciopino may be poured over French or Italian bread.

Owing to the present high cost of living, the people should take advantage of the cheaper kinds of fish, which when properly prepared are just as good and represent just as much food value as the more expensive kinds. Get the ciopino habit and fool the butcher several times a week.—H. B. Nidever.

PREPARATION OF ABALONE FOR FOOD.

It is well to give here the process of preparing the abalone for food, for many have attempted to cook it, only to find it too tough to chew. Place the shell, top down, on coals or a hot stove for a moment or two, and the animal will be easily removed. Put the meat in a strong solution of lye, made from wood ashes mixed with a little water, for about fifteen minutes, then rub with a brush or cloth, when all the black skin will come off. After rinsing in water, slice into steaks about one-third of an inch thick. Place a slice between cotton cloth and pound it with some wooden implement until the fiber of the meat is separated; then boil, fry, or broil, seasoning to taste.—*The American Angler*, Spring, 1917, Number.

NEW COMMERCIAL FISHERIES INVESTIGATION.

In anticipation of the revenue to be derived from the new fisheries tax law, which will be available for fisheries investigation and patrol work, the Fish and Game Commission has secured the services of Mr. W. F. Thompson, a fisheries investigator of note, to conduct investigations on the commercially important fishes of southern California. Mr. Thompson assumed the duties of his new position on June 1 and will first take up the problem of the tuna, or albacore, which is about the most valuable fish of southern California and one of which we know the least. Mr. Thompson has had the best of training for his work. He graduated in zoology at Stanford University, where he made a special study of fishes with the view of fitting himself for fisheries investigation work. His first field work was a survey of the commercially important mollusks of the northern California coast, for the Fish and Game Commission. For nearly six years since then he has been employed by the British Columbia Department of Fisheries, where he made investigations of the clams, abalones, halibut and herring. His reports on these investigations have been published by that department. His several reports on the halibut place him in the first rank of fisheries investigators. We look forward with confidence that the work of Mr. Thompson will be of lasting benefit to the fisheries of the state.

CONSERVATION IN OTHER STATES.

OREGON MAKES NUMEROUS CHANGES IN GAME LAWS.

Oregon's last legislature took the position that legislation should favor game rather than the huntsman and fisherman, and as a result many conservation measures were passed. The more interesting improvements in laws are as follows:

(1) The bag limit on deer with horns has been reduced from three to two. The season has been changed and shortened.

(2) Chinese pheasant hens are now protected. Two years ago, on the insistence of many sportsmen, a law was passed allowing one hen in every bag of five, and two hens in a bag of ten.

(3) Hunting and angling licenses now cost $1.50 each, instead of $1.00.

(4) The bag limit on trout has been reduced from 75 to 50 trout in any one day.

(5) Game breeders are now charged a license of $2.00.

NEVADA AND THE MIGRATORY BIRD LAW.

Nevada has incorporated in its game laws a proviso stating that the open season on migratory game birds shall always automatically change so as to conform to the "Regulations for the Protection of Migratory Birds," as they shall hereafter be prescribed by the United States Department of Agriculture, Bureau of Biological Survey.

PHEASANTS IN MISSOURI.

While a few years ago it was publicly announced that of the many Chinese pheasants introduced or hatched and liberated in Missouri, none had survived the deep snows of winter and the guns of the farmers and hunters, I am now able to tell you that the members of the Horseshoe Lake Hunting and Fishing Club are positive that two coveys are on their private grounds of 1,000 acres in St. Charles County, 25 miles northwest of St. Louis. When first seen last summer the coveys consisted of about eight birds each of different sizes, but fully grown in October. Crowing of three males was heard by club members on the same day in widely separated places.

Six years ago 18 pheasants were received by the club from the state commissioner, but all but one disappeared. The one survivor, a male, was noticed from time to time on the grounds, but was neither fed nor molested. It was only last summer that it became apparent that he had found a mate and that they had raised young ones. It may be supposed that the hen came from the adjoining farming region, where some of the

farmers claim they knew of the presence of pheasants on their land ever since they liberated them about the same time the club did. It appears therefore that the Chinese pheasant has done better in acclimatizing than it has become generally known. It is conceivable that the farmers do not find it in their interest to make it known that they have such nice birds on their land, as it would only attract the hunters.

Of the Hungarian partridges, which were freed by the Horseshoe Lake Club at the same time six years ago, some were seen for two years, but never since. It is thought they took to the cultivated hills adjoining the low, marshy club grounds.—Otto Widmann, St. Louis, Mo.

MARYLAND NOW HAS HUNTING LICENSE LAW.

The Maryland legislature has passed a hunting license law, the revenue to be used for purchasing game and restocking depleted covers, and for employing wardens. Soon after the law went into effect last fall over 5,000 licenses were issued. The licenses are in the form of red tags, which are worn on the arm. In addition, legislation giving protection to song birds was passed.

NEW YORK STARTS CONSERVATION MAGAZINE.

The New York State Conservation Commission has begun the publication of a monthly magazine called "The Conservationist." The subscription price is 50 cents per year. In the initial number (January, 1917) the aims of the magazine are thus outlined:

"Practical problems of conservation are before the people of the state of New York today, which in their importance have never been transcended. Their solution will require careful thought and full discussion. The *Conservationist* will take them up from time to time, and its pages will constitute a forum where any citizen of the state, who has something to say that is worth while and in good faith, can present his point of view.

"Freed from the necessity that controls dry reports, the *Conservationist* will aim to be an index of the very life pulse of conservation throughout the state. It invites the cooperation of every conservationist to this end."

The February number contains many interesting articles and is well illustrated. Most of the periodical is devoted to short general articles, as for instance, "The uncontrolled cat," "Tarleton Hoffman Bean" and "The vanished woods." There is a lack of editorials, and but one page of short notes, with the heading "Field notes."

ADVISORY BOARD ON WILD LIFE PROTECTION IN CANADA.

The Canadian government, by an order in council dated December 28, 1916, has appointed an interdepartmental advisory board on life protection for the purpose of formulating plans regarding the protection and use of the wild life—by which term is meant the fur-bearing and big game mammals, the wild fowl and other animal life—of the northwestern territories, and of advising in the administration of the Northwest Game Act and of the legislation under the recently ratified international treaty for the protection of migratory birds in Canada and the United States, and generally, for the purpose of advising it on questions relating to the protection of and use of wild life in Canada. The advisory board is constituted as follows: James White, assistant to the chairman of the commission of conservation; D. C. Scott, deputy superintendent general of Indian affairs; Dr. C. G. Hewitt, Dominion entomologist; Dr. R. M. Anderson, geological survey; J. B. Harkin, commissioner of Dominion parks.

Mr. James White is chairman and Dr. Hewitt is secretary of the board; Mr. White and Dr. Hewitt are also representatives of the government on the permanent consultative commission for the international protection of nature.—*Science*, N. S. Vol. XLV, No. 1159.

FUR CROP A LARGE ONE.

The annual production of fur in Minnesota approximates in value $1,310,875. There are taken annually about 3,000,000 muskrats, 75,000 skunks, 20,000 wolves, besides other varieties of fur-bearing animals. Fur farming has been engaged in to some extent, one operator reporting sales to the amount of $12,000 worth of foxes; another $6,635 worth of skunk. The industry is increasing and offers inducements.—*Fins, Feathers and Fur*, Dec., 1916.

PERMANENT LECTURER IN MASSACHUSETTS.

If the recommendation of Mr. E. H. Forbush, State Ornithologist of Massachusetts, in his annual report for 1916, be adopted by the state legislature, Massachusetts will employ a permanent lecturer to address the schools throughout the state, in order to awaken an interest in birds among the pupils. This is the first proposal of its kind and its prospects of success seem to be favorable.—*Current Items of Interest*, April 8, 1917.

A NEW BIRD SANCTUARY IN BRITISH COLUMBIA.

Bare Island, in Haro Strait (which separates Vancouver Island from the mainland), is the breeding home of a large colony of gulls, guillemots, cormorants, and puffins, and harbors many geese during autumn and winter. It has recently been constituted a bird sanctuary and the Provincial Museum at Victoria, an active agent for bird protection, has been made its legal guardian.—*Current Items of Interest*, May 2, 1917.

BIRD-PROTECTION PLACARDS IN MILITARY CAMPS.

The bird-protection placards of the British Society for the Protection of Birds have been posted in military camps in Great Britain.—*Current Items of Interest*, May 2, 1917.

THE WEST VIRGINIA LICENSE LAW.

West Virginia allows residents to hunt in their own counties free of charge. A free license, however, must be obtained. To hunt in any other or all counties of the state a $3 license is required. Non-residents are charged $16 for a license to hunt and $5 for a license to fish. Unnaturalized aliens are not allowed to hunt in the state or to carry firearms for such purposes. They are, however, allowed to fish after procuring a license costing $5. In West Virginia it is unlawful to hunt or fish on Sunday, to hunt or fish on enclosed or improved lands of another without written permission; to buy, sell, transport out of state, or serve at any restaurant or hotel any of the game fish, game animals or game birds of this state; to fish except with hook and line or troll line; to shoot or discharge firearms in or across any public road, or within four hundred feet of any schoolhouse or within six hundred feet of any occupied dwelling house; to wound carelessly or to kill any human being or live stock; to allow matter deleterious to fish to enter any stream of the state; to maintain any dam or other obstruction to the easy passage of fish up or down any stream without providing same with a fishway.

TEXAS NEEDS REFORMS.

Mr. H. P. Attwater, in a paper on "The Disappearance of Wild Life" (Bull. Scientific Society of San Antonio, Vol. 1, No. 3, pp. 58–59), points out the wanton destruction of wild life in Texas and suggests the following reforms:

1. A hunting license law.
2. A closed season on prairie chicken and antelope for a term of years.
3. A closed season for wild turkeys during February and March and no killing of turkeys on their roosts.
4. An open season on the mourning dove to correspond to the open season on quail.
5. Reduction of daily bag limits.
6. Control of the English sparrow.
7. The granting of scientific collectors permits.
8. A live, active association for the protection of wild life.

LIFE HISTORY NOTES

LAKE MERRITT—A REFUGE FOR WATERFOWL.

In the heart of the city of Oakland there is situated a state game refuge. On beautiful Lake Merritt, only five minutes walk from the City Hall, wild ducks congregate in great numbers each winter. The successive appearance of the different varieties is very apparent on the lake. The first wild ducks that reach us in the fall from the north are the sprig, or pintails, which arrive in California during the latter part of August, and by September 1 are here in tens of thou-

sands. The majority of these sprig probably come from the Klamath Reservation, near the border of Oregon and California.

The next migratory winter visitors arrive here a little before the middle of October from that portion of Alaska known as "The Flats." This area of about 300 square miles of marsh land lies the big inland lakes on the borders of our northern tier of states.

The hunting season commences in California October 15. For the first few weeks the ducks can not be driven away by the hunters from their favorite feeding grounds on the vast marshes between San Francisco and the capital of the state—

Fig. 45. Horseshoe crab taken in South San Francisco Bay. This Atlantic coast species was probably introduced into California along with oyster spat many years ago. Photograph by J. H. Mentz.

in the vicinity of Circle City and Rampart. As their feeding grounds become frozen, they leave and hunt lower and warmer latitudes for the winter. This second fall flight brings countless millions of pintail, widgeon, green-winged teal, shovelers, gadwall and mallard.

Later follows the flight from the Yukon Delta and the Saskatchewan country bringing other hordes of game birds. The canvasbacks, redheads, and bluebills are the last to arrive, and they come from Sacramento. But they soon discover lovely Lake Merritt, and by November 1 it is fairly alive with them.

Lake Merritt is a body of water about a mile long and one-half mile wide. It lies in the heart of Oakland, and is surrounded by some of the most aristocratic homes of that city. At the head of the lake stands Oakland's famous Civic Auditorium, erected at a cost of over a million dollars and seating 13,000 people. Miniature yachts, power boats and countless

pleasure craft make the lake their home. About a quarter of a mile of water, however, is wired off by the city authorities, and in this inclosure the wild ducks find protection.

realizes that he and his fellows are safe in Oakland's bird reservation. A wide automobile drive surrounds the lake, and from early morn until nightfall hundreds of visitors throng the park, delighted with

Fig. 47. Lake Merritt, Oakland, California, a state game refuge. Photograph by W. W. Richards.

Fig. 48. Canvasbacks, bluebills, and coots at north end of Lake Merritt. Photograph by W. W. Richards.

In the lake waters are seen the canvasback, the bluebill and the pintail, together with their ever constant friends, the mudhens. On the lawns congregate great flocks of sprig and widgeon (see figs. 48 and 49.) The wild bird of today soon

this most strange and wonderful picture of civilization and nature in such close touch with each other.

The city authorities see that birds are fed daily, and that they are in no way molested.

Oakland is indeed proud to welcome and take care of her feathered guests from the far north, knowing that the following year they will return with their broods and winter in California's most beautiful city.—W. W. RICHARDS.

A COMMON MALADY AMONG WATERFOWL.

Examination of the viscera of a sick swan secured near Butte Creek, Sutter County, California, showed that the crop of this bird was covered inside with large nodules or growths that had secreted a cheesy white matter that had gathered in the lower portion of the crop. This substance was probably mucous-like in its character before the specimen was placed in formaldehyde. These diseased areas were examined by Mr. Wetmore of the Bureau of Biological Survey and by Dr. Gallagher of the Bureau of Animal Industry and were found to be an infection of the fungus disease known as aspergillosis. Aspergillosis is a common malady among waterfowl, but is one that seldom kills large numbers of birds in a locality. The fungi that cause it are usually taken in when feeding among decayed vegetation. Usually aspergillosis shows most plainly in the air sacs connecting with the lungs that fill the body of the bird. Examination of these air sacs usually shows thickened membranes or yellowish or greenish areas in places where these membranes touch the body walls. Occasionally these growths are found in other parts of the body as in the case of the swan.

There is nothing that may be done for birds affected by the disease, as any that may be captured would be so far gone that treatment would be useless. As has been said above, however, the disease is of no great importance.—E. W. NELSON.

Fig. 49. Ducks feeding on lawns bordering Lake Merritt. Photograph by W. W. Richards.

HORSESHOE CRAB.

On the fourteenth day of May, this year, Tom Castagnolia, president of the "San Francisco Striped Bass Fisherman's Protective Association," brought into the office of the Fish and Game Commission a live horseshoe crab (*Limulus polyphemus*) which had been taken in South San Francisco Bay by Simone Bruscoe, a fisherman of Fisherman's Wharf. According to Mr. Bruscoe the crab was taken in comparatively shallow water in the neighborhood of Redwood City, San Mateo County, California. In picking up his net he found the crab entangled in the meshes and as he regarded it as a curiosity he brought it home with him. The accompanying picture, which was taken by Mr. J. H. Mentz, shows a very clear likeness of the animal.

In looking up the literature we find that in 1880 W. N. Lockington reported the presence of the King or Horseshoe crab (*Limulus polyphemus*) in San Francisco

Bay, where, he says, it must have been accidentally introduced with the oyster spat, which was regularly brought from the Atlantic coast. At that time the crab was of rare occurrence and as far as we can learn specimens have not been taken since, until the capture of this one, here illustrated. On the Atlantic coast, where in places the horseshoe crab abounds, they are seldom utilized as food. They are captured, however, in large quantities in pound nets and traps and ground up for use as a fertilizer.—N. B. SCOFIELD.

Fig. 50. Ducks as in figure 49 after being disturbed. Photograph by W. W. Richards.

BASKING SHARK TAKEN IN MONTEREY BAY.

On June 6, the Western Fish Company of San Francisco had on exhibition a shark captured in Monterey Bay by Santa Cruz fishermen. The shark was 18½ feet long and weighed nearly two tons. It was what is known as a basking shark and to ichthyologists as *Cetorhinus maximus*. As the shark has attracted a great deal of interest we quote the following from "Fishes" (pp. 196–197), by David Starr Jordan:

"The largest of all living sharks is the basking shark * * * reaching a length of 36 feet and an enormous weight. It is a dull and sluggish animal of the northern seas, almost as inert as a sawlog, often floating slowly southward in pairs in the spring and caught occasionally by whalers for its liver. When caught, its huge flabby head spreads out wide on the ground, its weight in connection with the great size of the mouth-cavity rendering it shapeless. Although so clumsy and without spirit, it is said that a blow with its tail will crush an ordinary whaleboat. The basking shark is known on all northern coasts, but has most frequently been taken in the North Sea, and about Monterey Bay in California. From this locality specimens have been sent to the chief museums of Europe. In its external characters the basking shark has much in common with the man-eater. Its body is, however, relatively clumsy forward; its fins are lower, and its gill-openings are much broader, almost meeting under the throat. The great difference lies in the teeth, which in *Cetorhinus* are very small and weak, about 200 in each row. The basking shark, also called elephant shark and bone shark, does not pursue its prey, but feeds on small creatures to be taken without effort. Fossil teeth of *Cetorhinus* have been found from the Cretaceous, as also fossil gill-rakers, structures which in this shark are so long as to suggest whalebone."

—N. B. SCOFIELD.

DUCKS AND GEESE PLENTIFUL IN PLUMAS COUNTY.

During March, 1917, there were more geese in the vicinity of Taylorsville, Plumas County, than the oldest inhabitant can remember having seen before. The geese feed on a species of sedge grass, the teal duck on a sort of water moss in the sloughs, the mallards and sprigs work out in the tules. I noted also 54 swans, all very tame. The swans do not appear to feed in daylight.—L. J. Warren.

DEER IN CALAVERAS COUNTY.

I've been through the Blue Mountain country (of Calaveras County) every winter for twelve years and I can say I never saw anything like the increase in the number of deer here. Every day we see them. The boys counted 29 in one herd and 32 in another, and besides we see numerous smaller herds. Yesterday I saw 20 without any effort on my part. This certainly speaks well for the enforcement of the game laws. Not over five years ago one had to tramp a considerable distance to find a deer, while a herd was quite a sight.—Joseph G. O'Brien.

THREE EASTERN BIRDS BECOMING ABUNDANT IN OREGON.

Mr. Stanley Jewett, of the United States Biological Survey, reports that several catbirds have been noted in eastern Oregon. The first record is for Baker County, August 11, 1906. Several of these birds have been seen in the eastern part of the state since that time. This year birds have been seen at five or six different places.

The bobwhite appeared in Harney County in 1908 and has increased rapidly since that time. The bobolink has been recorded in Grant and Baker counties.

THE SHEDDING OF ANTLERS.

Our blacktail buck shed his antlers on March 3, this year. The fact that this event occurred on January 25 last year, and the fact that one of our bucks on former occasions dropped his antlers on the same date (February 18) two consecutive years, does not appear to allow for any set rule in this matter.

The actual operation of shedding horns does not require the slightest effort on the part of the deer. In the above instance, I was scratching his head when something attracted him for a moment, and turning his head ever so slightly, one antler dropped.

Both antler and the place on the skull from which it dropped were smeared with blood. This formed into a scab and later disappeared.—Wm. N. Dirks.

A WINTER CATCH OF FURS.

My catch of furs between January 7 and January 30 in El Dorado County was as follows: 1 coyote, 1 striped skunk, 3 coons, 11 foxes, 11 bobcats, 30 skunks. In two weeks trapping near my home at Rescue I caught 20 skunks, 4 foxes, 3 bobcats, 3 house cats, 1 striped skunk and 1 coyote.—George Williamson, Jr.

UNITED STATES FOREST SERVICE COOPERATION.

MINK IN THE TRINITY NATIONAL FOREST.

Fifty-five to sixty mink were taken last year in the Trinity National Forest. Ranger Gray states that mink are found only along the watercourses, and they appear most numerous during the early spring months, usually during March and April. The food of these little animals consists almost entirely of fish. One trapper (Mr. J. N. McKnight) informs me that in digging out a den used by mink he uncovered twelve trout, ranging in lengths from six to ten inches each. The trout were covered with very moist earth, and from their appearance had been caught and stored by the mink within twelve hours. One mink only was taken from the den. Fewer mink are being taken from year to year and it is evident that close trapping is driving them to extinction.—E. V. Jotter.

LARGE CATCH OF FURS ON THE CALIFORNIA FOREST.

The catch of furs on the California National Forest for the past season on which we have definite information was as follows: 451 gray foxes, 261 skunks, 10 fishers, 121 bobcats, 3 mink, 30 coyotes,

49 coons, 36 ringtail cats, and 1 panther. In addition to this there was about $500 worth of fur shipped from the Covelo District and probably $200 worth from other parts of the Forest. From present indications there will be much more trapping done during the coming season. It is hoped that greater activity in this line will prove very beneficial to mountain quail and grouse, which seem to be steadily on the decrease, although comparatively few are killed by hunters. It is probable, however, that small hawks destroy more quail than any other single agency.

Owing to the season in Game District 2 opening a month later than in 1915 and the "no spike" law, deer were in better condition and were not so easy to kill. There were many more hunters, however, and it is estimated that in the neighborhood of 1,800 deer were killed during the season. This is about double the number which have been reported and is a conservative estimate, as it is hardly possible that anywhere near half of the deer killed are reported.—B. H. MACE.

TROUT PLANTED IN MONO COUNTY IN 1867.

Mr. Barney Peeler of Bridgeport, California, is authority for the statement that the Mono Lake Basin streams were stocked with trout from Virginia Creek in 1867, prior to which time these streams were barren. A mining company diverted the water at that time from Virginia Creek into Mill Creek and the trout (cutthroat) came into the latter stream. About this time trout were planted in Lee Vining and Rush creeks.—T. J. JANES.

MOUNTAIN QUAIL.

Mountain quail are getting very scarce in all parts of the Stanislaus National Forest, and at the rate they are disappearing, it will be a matter of a few years only until they are extinct. Very little hunting is done for this species alone, but quite a number are bagged during a season by hunters in pursuit of other game. Their nests are made on the ground, which would have something to do with their disappearance, since they naturally become a prey to snakes, and small predatory animals during the nesting period, mature birds as well as young and eggs being taken.

Mountain quail leave their winter haunts about April, traveling toward the higher altitudes, some stopping along the way to build their nests and rear their young, while others cross the summit and build their nests on the east side. The fall migration begins the latter part of August, and the birds return to altitudes of from two to three thousand feet about October, and here they winter. They feed on grass, seeds, berries and pine nuts.—ERNESTT BACH.

BOY SCOUT COOPERATION.

WHY DEER ARE DECREASING.

Santa Maria, California, December 3, 1916.

California Fish and Game Commission:

GENTLEMEN: There are many reasons why our deer are gradually becoming fewer and fewer; one is that when deer season opens, men, sometimes accidentally and sometimes purposely, kill a doe instead of a buck. Some men go out expecting to be home within one or two days of when they started, and, with them, the limit of deer, which, in most cases, they fail to do, so, in such a case, they get greedy and shoot at any sort of a deer, no matter if it is a buck, doe, or a fawn. If they should happen to kill a doe, they would be afraid to take any part except the hind or fore quarters home with them. They might leave the carcass wherever it happened to fall. Some men, after the season has been closed, go out and kill deer just the same as they would if the season was open; when they do, this counts up on the destruction of the deer.

On the second page of *California Fish and Game* it states very clearly how greedy some hunters are. They get their venison unlawfully, and at the expense of the little fawns, who probably die of hunger, because some greedy hunter has killed their mother.

Very sincerely,

FRED SWORD,

Patrol Leader of Crow Patrol, Santa Maria, Cal.

Scoutmaster, R. C. Wylie, No. 23202.

ADVOCATES DESTRUCTION OF ENGLISH SPARROW.

2716 Chester Ave., Bakersfield, California,
May 1, 1917.

State Fish and Game Commission:

DEAR SIR: The English sparrows now have begun to nest and it is now that the state of California should fight them. I have experimented with them by watching several nests closely and I find that this cannibal among other birds is very hardy. It can soon learn to fly after it has its wing feathers fairly started and it eats anything from fruit buds to bits of manure. It has only one good use that I can find and that is cleaning up the streets, which it does fairly well, but on the other hand it eats fruit buds and practically makes it impossible for an average person to raise vegetables, especially lettuce. The grown birds are very smart and watch the garden being planted —they are not afraid of scarecrows and as soon as the garden is planted they have what one might call a bird feast, by digging up there and everywhere, the small seeds. Their favorite nesting places are in cornices and nooks and corners, although if neither of these are available they will nest in trees. One house in the town of Taft burned down to the ground and its cause is supposed to be unknown. But I have noticed a bird nest under one eave. I went to see where the house was burnt the most and found it where I expected it, that was where the bird's nest was. The English sparrow, of course, never thinking of danger, for they have very poor thinking power, had probably seen a good match on the ground, and attracted by its color, thought it would make a good straw for its nest, and in placing it in and among the other bits of string, weeds, sticks, etc., it caught fire. Now that a new year has come the people ought to turn out to fight down the pest, for at the present time I could easily say without exaggerating that there are one billion or more sparrows in this state alone. Hoping this will help me have the honor of winning the pheasants, I remain, yours truly,

L. PAUL MARRIOTT.

BOY SCOUTS TO BECOME GAME WARDENS IN OREGON.

The State Game Warden expects to receive a great deal of assistance from Boy Scouts throughout Oregon. Briefly, the plan is to appoint from more than two thousand Boy Scouts not to exceed one hundred of their number to the position of Boy Scout Game Warden. Examinations will be held every Saturday for the next few months at the office of the State Game Warden for the purpose of determining the scout's knowledge of the game laws, outdoor conditions and methods of cooperation with the department. A number of these examinations have already been held and several scouts have been awarded the coveted badge of authority and commission, which is signed by Governor Withycombe and the State Game Warden.

The boys who have already been examined show a remarkable knowledge of the game laws and have answered almost perfectly more than one hundred and fifty questions propounded to them. While it is not believed that the Boy Scouts will be of any material assistance in rigidly enforcing the provisions of the law and in making arrests, nevertheless, the Game Department feels that the moral influence of the scouts on other boys will be great.

To illustrate, a few days ago a number of boys were shooting robins with slingshots in a certain locality. Robins are protected, and a Boy Scout happening upon the scene, immediately called the attention of the boys to the fact that robins were protected and asked them in a gentlemanly and boy-scoutly manner to stop this practice. The boys respected the scout and told him they would not do it any more.

The real value of such an influence can not be overestimated. The boys of today are the sportsmen of tomorrow, and if they grow up with a thorough belief in the protection of our song birds and our animal life, they will be good sportsmen and good citizens.—*Oregon Sportsman*, April, 1917.

PHILADELPHIA BOY SCOUTS AS BIRD GUARDIANS.

A number of bird sanctuaries have been established on large estates around Philadelphia, each of which is under the care of a selected troop of Boy Scouts, who install resting and feeding boxes, post the place and take such measures as are practicable against cats, red squirrels, snakes, and eggers. In the spring they plant shrubs suitable for nesting sites, food and shelter.—*Current Items of Interest*, April 8, 1917.

VIOLATIONS OF THE FISH AND GAME LAWS.

March 1 to May 31, 1917, Inclusive.

Offense	Number of arrests	Fines imposed
Game.		
Hunting without license	9	$140 00
Deer, close season, killing or possession	15	225 00
Female deer, killing or possession	4	200 00
Illegal deer hides	1	
Quail, close season, killing or possession	4	125 00
Ducks, close season, killing or possession	6	175 00
Doves, close season, killing or possession	2	25 00
Shore birds, close season, killing or possession	1	10 00
Cottontails, close season, killing or possession	3	60 00
Nongame birds, killing or possession	6	41 00
Total game violations	51	$1,051 00
Fish.		
Angling without a license	19	$290 00
Fishing for profit without license	22	220 00
Trout, close season, taking or possession	42	715 00
Trout, excess bag limit	10	125 00
Trout, taking other than with hook and line	5	215 00
Striped bass, underweight	2	100 00
Black bass, close season	2	
Halibut offering for sale, underweight	2	10 00
Salt water perch, offering for sale, close season	5	85 00
Catfish, offering for sale, undersize	6	80 00
Crabs, undersized or female, taking or possession	15	85 00
Clams, undersized, excess bag limit	16	230 00
Abalones, undersized, close season	14	220 00
Dried California shrimp in possession	4	80 00
Dynamiting fish	1	
Illegal nets	7	100 00
Total fish violations	172	$2,618 00
Grand total fish and game violations	223	$3,669 00

SEIZURES—FISH, GAME AND ILLEGALLY USED FISHING APPARATUS.

March 1 to May 31, 1917, Inclusive.

Game.		
Ducks	30	
Quail (4 live)	5	
Nongame birds	15	
Deer meat	200	pounds
Fish.		
Trout	700½	pounds
Striped bass	306½	pounds
Catfish	570	pounds
Halibut	2,005	pounds
Salt water perch	855½	pounds
Black bass	2	pounds
Crabs	285	
Abalones	300	
Clams	2,000	
Dried shrimp	2,200	pounds
Nets, traps and fishing outfits	15	
Searches.		
Illegal fish and game	11	

CALIFORNIA FISHERY PRODUCTS FOR JANUARY, FEBRUARY AND MARCH, 1917.

Species of fish	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Solano, Yolo	Sacramento, San Joaquin	Alameda, Contra Costa	San Francisco, San Mateo	Santa Cruz	Monterey	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego	Other counties	Mexico	Total
Albacore											68,945					68,945
Anchovy							500		150,933		5,185		5,130			161,748
Barracuda										27,350	388,711		8,365		96,092	520,518
Bonito											1,368					1,368
Boccaccio							14,413	6,997	105,201							127,611
Bluefish									4,559							4,559
Chilipepper							44,940		18,747							63,687
Carp				3,598	24,925	22,549	2,179							7,960		61,212
Catfish		27,652		1,721	33,995	16,563										79,931
Coalfish							1,983	1,800			200					3,983
Cultus cod	63						97,400	42,528	51,320							191,311
Dogfish							1,080				3,987	83	6,666			11,816
Flounder	15,997		109			153	162,150				180	787	1,142			180,318
Halibut			17				6,015	6,239	1,509	132,686	483,708	4,215	34,716		726,999	1,397,004
Hake							20,695	33,500			7,938	615				64,748
Herring	5,745		2,481,440			124,355	721,830	33,250	5,228							3,374,623
Kingfish							1,939	4,188	331	1,050	274,835	1,340	8,235		60	292,098
Mackerel									11	55	87,726		9,388		8,560	105,740
Mullet											131			24,447		24,578
Pike				18	2,598	2,718										5,274
Pompano							150	638			1,342					2,130
Perch	5,733		19,759			64	28,713	2,994	14,352		98,819	3				146,307
Rock bass										500	48,398	6,792	2,534		120	58,634
Rockfish	1,884						202,552	78,606	288,121	75,640	1,661,594	9,693	337,485		4,539	2,659,820
Sole							1,911,767	402,947	15,484		6,865		95			2,337,158
Salmon			128	98,684	17,742	421,592	1,987	27,104	208,167					603		955,367
Smelt	19,056	570	6,950			89	28,407	372	4,467	20,695	31,829	32,682	18,513		160	157,670
Sea bass (white)							2,845	545	232		67,807	80	4,537		725	76,031
Sea bass (black)											60		2,677		2,085	5,922
Sandab							369,629	90,533	126		5,640	694				466,624
Striped bass		40	6,694	68,974	58,021	136,778	43,703		2,542							314,752

Shad			55	7,558	925	56,800	5,934	1,251			28					72,496
Sturgeon				533	1,847	1,141	83									3,606
Sardine			225				225	670	4,151,355		10,788,305		6,344,270			21,275,370
Skate							64,065				338					64,503
Sculpin											550		50			600
Sea trout																
Tom cod							19,603									19,603
Turbot			247													247
Whitebait			17				15,198									15,215
Yellowtail											54,819		350		35	54,704
Miscellaneous	297		2,636	2,559	15,589	5,106	14,222		900	170	57,486	2,045	2,353		1,640	105,513
Total fish	48,478	38,202	2,515,357	178,286	139,983	784,977	3,788,593	732,322	5,210,100	257,306	13,354,889	56,386	6,767,995	33,010	840,291	34,736,193
Crustaceans—																
Crab (dungeness)	1,039						25,617	4,099½	19,038							49,783½
Spiny lobster										33,094	60,819	4,511	14,821		35,385	149,230
Shrimp							104,065									104,065
Ecrevisse																
Mollusks—																
Squid									21,556		54,362		80,191			156,109
Cuttlefish			14				2,009	5,275	1,429		45					8,772
Clam (Pismo)								3,825		68,169						71,994
Clam (cockle)		225	38,019								2,800					41,044
Clam (softshell)		4,878	22,022			23,200	1,312									61,413
Clam (mixed)	7,930	202	4,068				298			615	950	2,250				16,405
Oyster (shell), No.							302,530									302,530
Abalones		1,575						819	122,937	5,708						130,130
Mussels			384					2,140	4,420	1,145	26,192	1,500				35,794
California oysters			5,290													5,290
Bay mussels						4,000	7,253									11,303

STATEMENT OF EXPENDITURES FOR THE MONTHS OF JANUARY, FEBRUARY, MARCH AND APRIL, 1917.

	January	February	March	April
General Administration.				
General administration	$2,336 25	$1,753 97	$1,904 08	$1,944 93
Research, publicity and education	219 63	210 83	419 21	196 61
Printing	1,379 00	52 22	501 43	188 26
Fish exhibits	50 92			
Game exhibits	40 91			
Game farm	249 99	344 91	293 16	282 65
Mountain lion bounties	320 00	500 00	760 00	280 00
Lithographing hunting licenses				
Lithographing anglers' licenses				
Hunting license commissions and refunds	2,582 50	511 20	571 40	882 60
Anglers' license commissions and refunds	945 20	502 10	355 30	90 60
Market fishing license commissions and refunds	59 00	37 00	121 50	224 50
Totals	$8,143 91	$3,912 23	$4,835 98	$4,095 95
Patrol.				
San Francisco District	$4,818 63	$4,330 43	$4,892 73	$4,975 42
Sacramento District	3,241 39	3,277 99	3,497 48	3,598 75
Los Angeles District	1,752 96	1,961 69	2,063 43	2,445 60
Launch patrol	548 10	550 27	707 60	555 71
Prosecutions—fish and game	157 99	98 45	361 05	243 25
Crawfish inspection	100 00	100 00	132 26	278 33
Winter game feeding	12 20	1 70		23 04
Accident and death claims		541 11	124 04	124 04
Totals	$10,631 18	$10,861 64	$11,751 59	$12,243 54
Department of Fisheulture.				
Hatchery administration	$728 22	$674 93	$762 48	$723 16
Mount Shasta hatchery	2,316 37	1,582 12	1,499 63	1,499 52
Mount Shasta auxiliary stations	20 00	408 67	400 20	461 00
Mount Whitney hatchery	467 13	543 67	347 38	577 60
Mount Whitney auxiliary stations				
Tahoe hatcheries	10 00	44 11	212 24	373 60
Tahoe hatcheries auxiliary stations				
Mariett-Carson hatchery	23 44			
Fort Seward hatchery	301 70	198 88	231 43	256 31
Ukiah hatchery		1 98		39 00
Snow Mountain station	70 27	295 78	311 61	450 22
Brookdale hatchery	107 95	151 74	165 33	146 94
Scotts Creek station	35 05	109 08	253 10	197 83
Almanor station	5 00	8 30	434 50	352 92
Bear Valley hatchery	15 15		375 27	248 10
Yuba City shad station				
Fish distribution	14 86	3 00	3 00	623 00
Fish transplanting				
Screen, fishway, water pollution	396 80	497 25	344 40	336 96
Totals	$4,510 94	$4,460 51	$5,334 57	$6,227 25
Commercial Fisheries Research.				
Fishery research and patrol	$311 25	$302 35	$377 75	$427 50
Grand totals	$23,597 28	$19,526 73	$22,299 89	$22,967 24

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CALIFORNIA FISH AND GAME

"CONSERVATION OF WILD LIFE THROUGH EDUCATION"

Volume 3 SACRAMENTO, OCTOBER, 1917 Number 4

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THE SHARKS OF CALIFORNIA.

By EDWIN CHAPEN STARKS, Stanford University.

Now that the conservation of food is a matter of public interest it seems a propitious time to call attention to the great amount of possible food that we allow to go to waste in the sharks and skates. In Europe nearly all of the fishes of this group command as high a price in the market as do other coarse fishes. The writer has eaten several species of them in Italy and France, and though they can not compare with our fine-fleshed, delicately-flavored fishes, they do compare very well with many of our fishes and excel some of our coarser ones that we use in abundance.

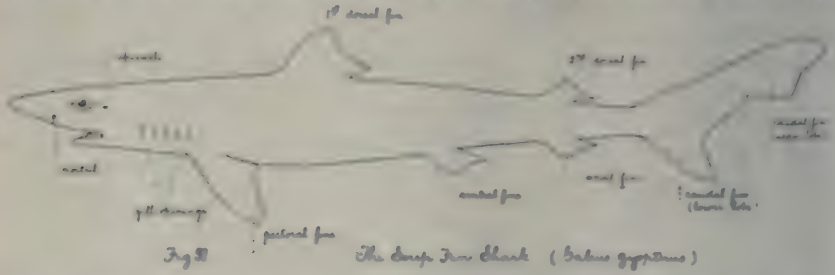
We are just beginning to use and appreciate the grayfish, but most species, if not all, of this group are edible to judge by Mediterranean markets. Doubtless experimenting would show us that some of the sharks and skates are very good, and some, perhaps, so coarse and ill-flavored that we would not use them at all.

By causing a market demand for these fishes we should not only introduce a cheap fish food, but by reducing their number we should save many better fishes, as well as clams and oysters, of which sharks and skates eat great quantities, destroying thousands of dollars worth

of valuable food every year. They are counted as pests by the fishermen, for they not only take bait intended for marketable fishes, but they tangle and destroy the fishing gear.

Sharks and skates are the oldest and most widely distributed of the fishes. They have no bones, the skeleton being entirely of cartilage. They have no true scales, but are naked, or more usually covered with fine, sharp prickles, so that the skin resembles sandpaper. In fact, at one time sharkskin was used by cabinetmakers as they now use sandpaper. These fishes usually have five gill openings, though some forms have six or seven. Two of these exceptions we have on our coast. The tail fin is uneven, the "backbone" extending into the upper part of it, which is longer than the lower part, or it may extend in a whip-like organ in some skates. In the male a tube-like reproductive organ is developed on the hinder margin of each ventral fin. In all of our species the mouth is on the lower surface of the head with the snout extending over it. In some forms the eggs are hatched within the body and the young brought forth alive. In others the eggs are deposited on the sea bottom, where they remain uncared for until they hatch.

In the following account the sharks only are considered; the skates, which are closely related to them, being reserved for a future article. The characters here given will serve, it is hoped, to identify all of our



sharks, but it will be necessary to learn the names of the fins and a few other things as given in figure 51.

1. The cow shark (*Notorhynchus maculatus*) may be known from all others on our coast by its seven gill slits. It is sandy gray in color and has small black spots scattered over it. This species and the next have only one dorsal fin. It is not very uncommon and is known along the entire coast from San Diego to Puget Sound.

2. The shovel-nosed shark (*Hexanchus griseus*) may be known from all others by its six gill slits. It is dark gray in color. It is widely distributed, being known from Scotland, the Mediterranean, the West Indies and northward on our coast to Puget Sound. It reaches a length of twenty-five feet. This shark must not be confused with the skate (guitar fish) known in southern California as the shovel-nosed shark.

3. The bullhead shark (*Heterodontus francisci*) is the only shark in our region that has a spine at the beginning of each dorsal fin and an anal fin in addition (see fig. 52). Another shark has dorsal spines but lacks an anal fin. This shark, as well as the shovel-nosed and cow shark, is interesting from the fact that its near relatives lived in early geologic

ages and it has changed but little from them. It is rather common on the southern California coast and does not grow to be over two or three feet in length. Above each eye is a high ridge, giving the animal

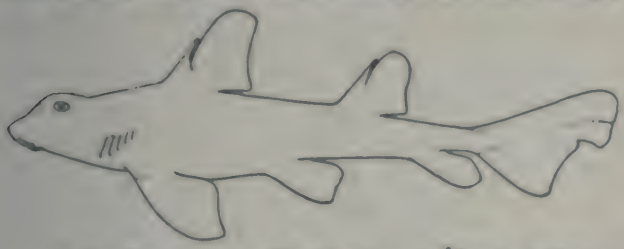


Fig 52 The Bullhead Shark (Heterodontus francisci)

a rather bizarre appearance. It is brown in color and has small black spots scattered over it. It feeds on crabs and clams which it crushes between its blunt molar-like teeth. The egg cases of this shark are often picked up on the beaches. They are conical, leather-like, and have a thin ledge arranged spirally around the outside, giving them a twisted appearance.

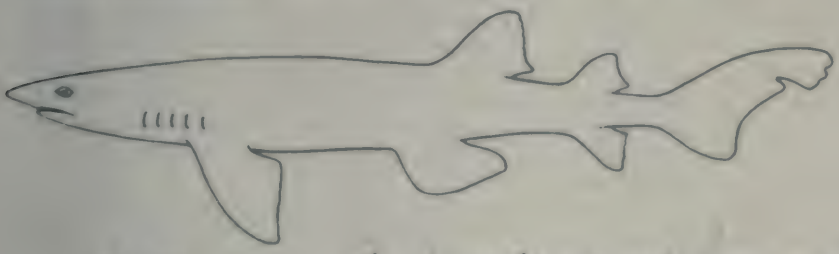


Fig 53 The Swell Shark (Catulus uter)

4. THE SWELL SHARK (*Catulus uter*) may be known by its having an anal fin and in addition the first dorsal not in front of the ventrals (see fig. 53). Two other species of *Catulus* are found on our coast, but they are very rare and found in deep water, and are little apt to be seen, therefore they are not included here. They, too, have the above combination of characters, but the swell shark differs from them in having the distance from the tip of the snout to the edge of the upper lip just a little greater than the long diameter of the eye. It is grayish and tinged with yellow below, while dark crossbars are on the back. Blended dusky-brown spots are scattered over the body. The swell shark is about three feet in length at full size and is found from Monterey Bay southward to San Diego. It is abundant in the Santa Barbara Channel and is often taken in the lobster pots set for the spiny lobster. It gets its name from its habit of swelling itself up with air when it is taken from the water.

The following six genera all belong to one family: *Mustelus*, *Triakis*, *Galeus*, *Galeocerdo*, *Prionace*, and *Carcharinus*. We shall first give the characters that separate the family as a whole from our other sharks

and under each species the characters that will separate it from others of the family.

The first dorsal entirely in front of the ventrals; second dorsal opposite to the anal; no dorsal spines; the last gill opening above the base of the pectoral; eyes with an inner eyelid; an anal fin present; a notch below the tip of the upper caudal lobe; the head not mallet-shaped nor the tail as long as the rest of the body.

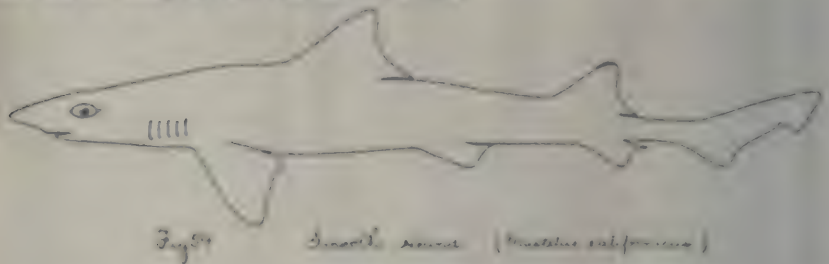


Fig 54 Smooth Hound (Mustelus californicus)

5. The smooth hound (*Mustelus californicus*) may be known by its small, blunt, pavement-like teeth arranged in oblique rows; even by the aid of a magnifier no point appears on the teeth as in the next species (see fig. 54). When the point of the pectoral fin is held close to the body it does not reach past the front fourth of the base of the dorsal. Neither it nor the next species has the lower lobe of the caudal projecting. This shark is as abundant on the southern coast as the grayfish is on the northern. It is known northward to San Francisco. It is a uniform lead color, growing white below, and does not exceed three and one-half feet in length.

The apparent difference in the shape of the front part of the head between *Mustelus californicus* and *Mustelus henlei* shown in the drawings of these two species is brought about by the former having been made from a photograph, which shows perspective, while the latter is, as usual, drawn like an architect's plan, without perspective. There is little or no real difference in this respect between the two.

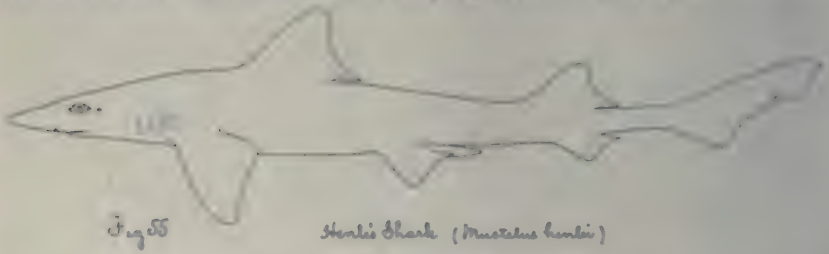


Fig 55 Henle's Shark (Mustelus henlei)

6. Henle's shark (*Mustelus henlei*) in general appearance is much like the last, having very fine teeth and the lower lobe of the caudal not projecting, but a magnifying glass shows that the teeth have points and that most of them in the upper jaw have a small basal point on each tooth (see fig. 55). It may be easily known from the last by the posi-

tion of the dorsal above the point of the pectoral. When the pectoral is held close to the body its point reaches to under the middle of the dorsal base. Little is known as to the range and abundance of this species as it has been passed over as the smooth hound. It is known from about San Francisco and southward.

7. The little leopard shark (*Triakis semifasciatus*) may be known from others of its family (see family characters above) by the definite black crossbars across the back and extending down to the middle of the side. On the lower part of the side are round black spots, one or more opposite the space between each two bars.

This shark is found south of San Francisco to San Diego. Southward it is very abundant, but not so abundant as the smooth hound. It does not exceed three or four feet in length.

8. The soup-fin shark (*Galeorhinus zyopterus*) (see fig. 51) may be known from others in its family (see family characters above) by the teeth on the side of the jaw being notched on the outer edge below the point and the lower part of the notch divided into from three to five points. This shark is abundant south of San Francisco, especially below Point Concepcion. It reaches a length of six feet and is of some value for the oil which its liver yields, but more particularly for its fins, from which the Chinese make a finely-flavored soup, the cartilaginous fin rays dissolving into a nutritious gelatine. They consider the fins of no other American shark of such value for food. Most of the fins on the market are used by Chinese in the United States, but some are shipped to China.

Like most sharks, this species readily takes a hook baited with any sort of meat, but particularly with herring or other silvery fish. When hooked the big ones afford some sport, but tire easily. They are usually found in water from twenty-five to fifty feet deep, but are not uncommon in shallow water.

9. The tiger shark (*Galeocerdo tigrinus*). This shark may be known from the others of its family (see family characters above) by the presence of a pit at the base of the tail on the upper surface and in addition a pore (spiracle) just behind the eye. Two other species in this family have the pit and others have the pore, but no other has both. The teeth are alike in both jaws, large and triangular, notched on the outer margin and finely serrated (saw toothed) on the edges. The color is brown with numerous dark spots scattered over it larger than the eye. The adults may be nearly plain. This shark is not rare in tropical seas and is reported by fishermen as occurring along the southern California coast. It is only known from this region to zoologists, however, by some jaws of a specimen captured near San Diego. It is said to reach a length of twenty-five or thirty feet, and next to the great white shark is the most dreaded by sailors, forming the basis of not a few of the forecastle "yarns."

10. The great blue shark (*Prionace glauca*). This shark differs from other members of its family (see family characters above) in having no pore behind the eye and in addition the first dorsal nearer to the ventrals than to the pectorals (see fig. 56). The color is a

light blue gray, much lighter on lower parts. This species is abundant in tropical seas, not uncommon in British waters, and is occasionally taken about San Francisco. It reaches a length of fifteen or twenty feet and shares with many other sharks the reputation of being a man eater.

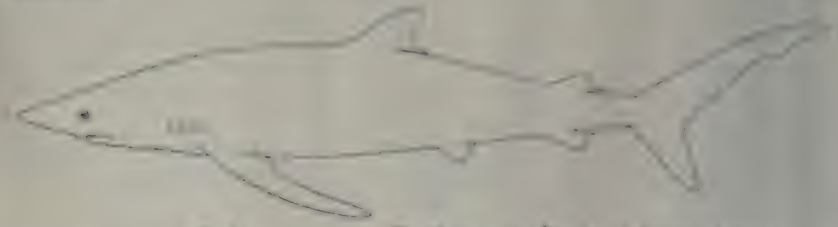


Fig 56 The Great Blue Shark (Carcharias glaucus)

11. THE BAY SHARK (*Carcharinus lamiella*). This shark and the last are the only ones of their family (see family characters above) without a pore (spiracle) behind the eye. It may be known from the great blue shark by the position of the first dorsal, which is nearer the pectorals than to the ventrals. Color plain gray, white below. This species is known from southern California to Mazatlan, Mexico. A specimen taken at Santa Catalina Island a few years ago measured twelve feet in length.

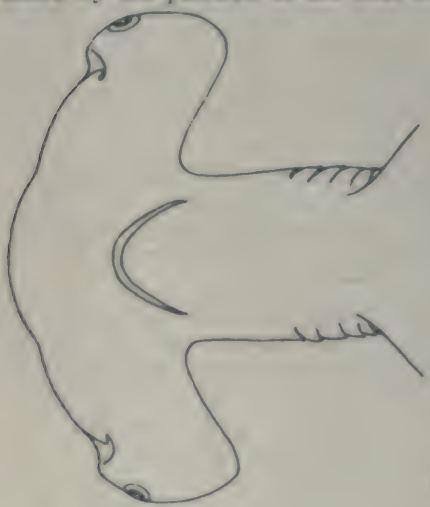


Fig 57 The Hammerhead Shark (Sphyrna zygaena)

12. THE HAMMER-HEAD SHARK (*Sphyrna zygæna*). This shark is known at once from all others on our coast by the sides of the head being developed far outwards from the rest of the body, forming outstanding lobes on which the eyes are placed (see fig. 57). The color is plain slaty-gray. This remarkable shark is common in all warm seas and occasional specimens are taken on our southern California coast. It reaches a length of fifteen feet and has an evil reputation among sailors and fishermen. Its food consists largely of bottom-feeding fishes.

13. THE THRESHER SHARK (*Alopias vulpes*). This shark may be known at once by the great length of its tail, which is about as long as the rest of the body (see fig. 58). The thresher shark is of wide dis-

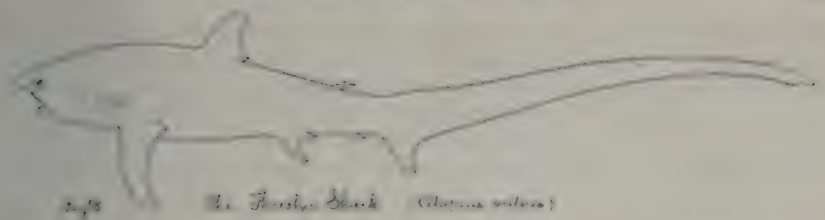


Fig 58 The Porbeagle Shark (Lamna nasus)

tribution, being found in all warm seas and occasionally taken on the California coast north of San Francisco. It reaches a large size and the powerful strokes it gives with its tail renders its capture a rather difficult matter.

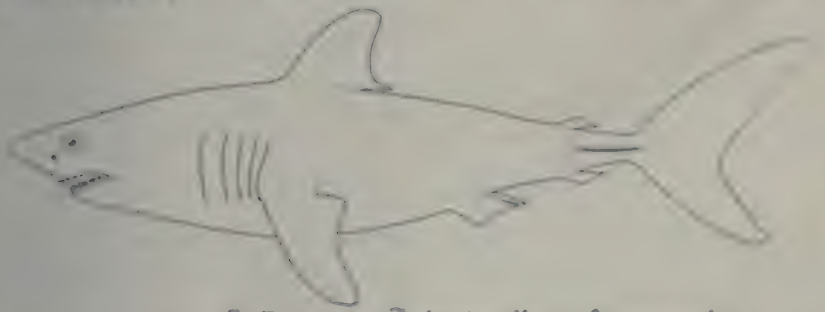


Fig 59 The Mackerel Shark (Lamna cornubica)

14. The mackerel shark (*Lamna cornubica*). The caudal fin evenly rounded behind, with only a slight notch below the upper lobe; an outstanding keel along each side of the tail; *the teeth sharp and their edges entire* (not saw-toothed) separates this shark from other west coast forms (see fig. 59). Color blmish-black above, growing abruptly white at middle of sides. The mackerel shark is widely distributed over the northern Atlantic and Pacific and is not rare on the California coast. It reaches **a length of ten feet.**

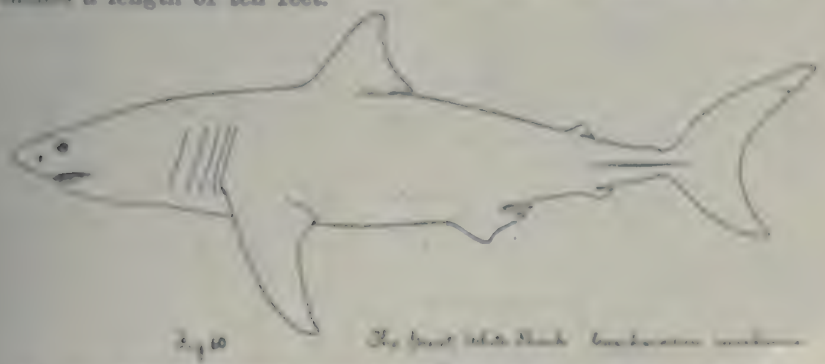


Fig 60 The great white Shark (Carcharodon carcharias)

15. The great white shark (*Carcharodon carcharias*). The caudal fin evenly rounded behind and with only a slight notch below the point of the upper lobe; an outstanding keel along each side of the tail, all of which are as in the mackerel shark, but this shark has the teeth triangular and the edge of each broken up into saw-tooth like points (see fig. 60). Color, leaden gray on back and sides, white below. This

shark is widely distributed in warm seas and reaches a large size. It is probably not common in our region. A few specimens taken in Monterey Bay have been recorded up to twenty-four feet in length. A specimen recently taken at Santa Monica is said to have measured thirty-two feet in length. Among sailors the great white shark, otherwise known as the man-eater shark, has the most evil reputation of any of the sharks.

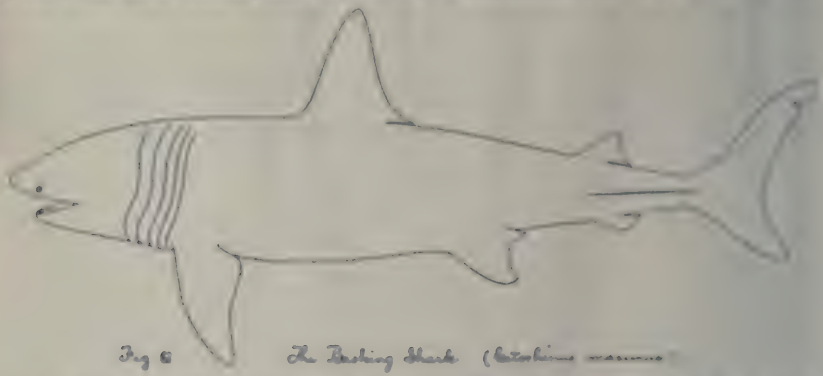


Fig 6 The Basking Shark (Cetorhinus maximus)

16. THE BASKING SHARK (*Cetorhinus maximus*). The size of the gill slits, which nearly meet under the throat, at once identifies this great shark (see fig. 61). It has the caudal fin and caudal keels as in the last two. The basking shark is found in Arctic seas and is not infrequently taken as far south as Monterey Bay. Recently one was taken at Santa Monica. It is known to reach a length of thirty-six feet. Its habit of remaining motionless or drifting slowly along the surface of the water as if basking in the sun has given it its common name. It is said to be easily approached and harpooned when thus at the surface, but its final capture is difficult and dangerous on account of the powerful blows it may deliver with its tail. In Monterey Bay it has sometimes been caught in gill nets by swimming into them and then turning over and over, wrapping them tightly about its head, closing its gill slits, and so strangling. Its teeth are smaller than those of any other shark, there being about 200 in each row. This, together with its long, close-set gill rakers and sluggish habits, indicates that it probably feeds upon small organisms, rather than upon fish or other animals that would entail swiftness in their capture.

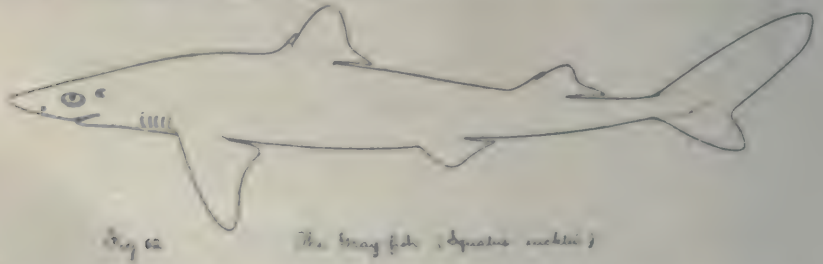


Fig 62 The Gray fish (Squalus suckleii)

17. THE GRAYFISH OR DOGFISH (*Squalus suckleii*). The absence of an anal fin, together with the presence of a spine in front of each dorsal fin, at once serves to identify this shark (see fig. 62). Its color is

18 THE ANGEL SHARK OR MONK-FISH (*Squatina californica*). This shark is flat and disk-like and is more easily confused with the skates than with the sharks, but it may be known by the gill openings being slaty-gray, shading to white on lower parts. White spots are often scattered over the body, especially in the young. The grayfish is extremely abundant along our coast and northward to Alaska. South of Point Concepcion it is only found in deep water, and is probably not very common, but northward it occurs in shallow bays in great numbers. It does not exceed a length of three or four feet.

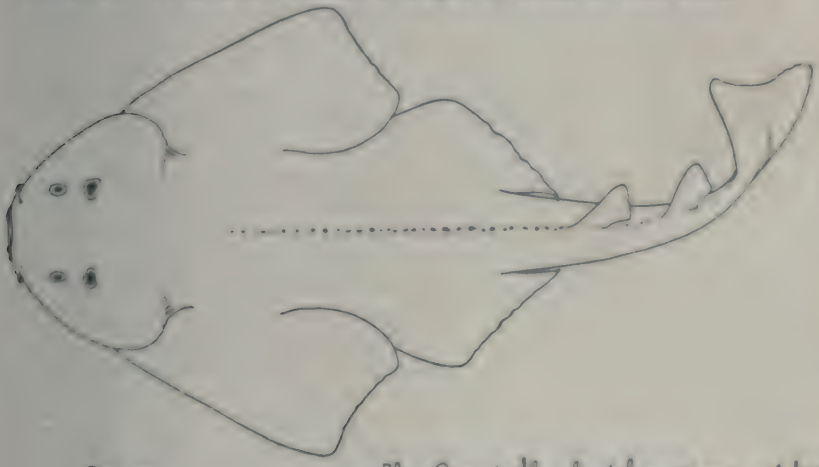


Fig 63 The Angel Shark (Squatina californica)

crowded together in a deep notch behind the head (see fig. 63). It is found in all warm seas and on our coast it is not rare south of San Francisco.

TEMPERATURE AND THE ALBACORE.

By WILL F. THOMPSON.

The research on the albacore now proceeding under the direction of the California Fish and Game Commission has been under way but a short time, yet certain facts as to the correlation of the temperature with the catch seem important enough to call for remark. Rarely, in so far as the writer knows, has there been found a case in which the correlation is as evident and clearly cut. Further investigations are in progress, and it is hoped that in the final report it will be possible to indicate various interesting applications of the observations made here. The fact of the correlation can not well be doubted, but there remains the question as to whether it is not in part due to certain factors allied with temperature.

The albacore fishery, at first glimpse, is one dependent to a great degree on the activity of the fish, the acuteness of its vision, and its hunger. The boats used are large, seagoing, and motor driven, carrying three to five men. They leave port at about midnight, catching the live

bait of sardines and anchovies (or other species) with a seine before daybreak. This they place in the stern of the boat in a pyramidal box through which fresh sea water is continually pumped to keep the bait alive, for it is thought that the albacore prefers live bait to all other. Then lines with bone or rag lures, called "jigs," are dropped a hundred feet astern, more or less, and towed at full speed barely below the surface of the water until an albacore "strikes" them. Sometimes, on the best days, the fish, shining like silver in the bright sun, leap clear into the air as they strike the "jig." Then in great haste, lest the fish pass on, the live bait is thrown out in dip netfuls while the boat is stopped and brought about. The live bait attracts the school of albacore to the boat, and the throwing out of the bait is called "chumming" them. Then hooks on hand pole and lines are baited with sardines, or anchovies, and dropped overboard. The fish in the school may be seen swimming swiftly to and fro in the clear water under the boat, their long pectoral fins extended. While they remain they take the baited hooks with great rapidity; then, perhaps after a ton or but fifty pounds has been caught, the school vanishes as quickly as it came, and trolling with the "jigs" is resumed. The fish are first caught directly on the surface by the "jig," and although the fishermen speak of them as "coming up," an unprejudiced observer must hesitate long before he concludes that they abide at any considerable depth, at least during the height of the summer. Nowhere in the world is there a fishery so beautifully adapted as an index to the habits of the fish concerned, for its activity and its hunger are vital factors in the success of the catch.

Considering recent work on the effect of temperature on activity and digestion, it was entirely natural to turn to a comparison of temperature fluctuations with those of the catch, particularly as the fluctuations of the catch are such a prominent feature of the fishery. For such a comparison, the ideal data would be the temperatures of the surface water where the fish were caught, but when the variations which exist between near-by areas of water, the diurnal changes, the weekly and monthly fluctuations are considered, the number of observations necessary becomes excessive. There is a probable index to the varying temperatures of the water in the admirable records kept by the Weather Bureau of the United States, to whose various officials the writer is deeply obliged for their assistance. The minimum temperature reached during the night at such places as San Diego, Avalon, and Santa Barbara, must be greatly influenced by the warmth or coolness of the near-by bodies of water, if indeed the air and water temperatures are not resultant in good part from the same meteorological conditions. Data as to this will be presented in the final report. It has been assumed in this paper that the temperature of the air affords a good criterion of the fluctuations in that of the water.

There are of course many things about the catch which must be guarded against in accepting it as representative of the "abundance" of fish, as that term is usually understood among the fishermen. Chief among these is the fact of the derivation of the catch from different

localities at various seasons. Without going into details, it has been thought best to utilize the catch of the San Diego boats during their whole season as being derived from a region whose temperature is indicated by the San Diego records. Those of the more northern canneries in Los Angeles County take their catches almost altogether in the more northern districts during the latter part of the season, especially after the San Diego season has closed, and therefore emphasis is laid on that part of the record as being more apt to reflect the true condition of affairs. Important, also, is the varying ability of the fishermen, and what may be called the "catching capacity" of each boat. To eliminate this source of error, it has been necessary to treat each catch of each boat as a per cent of its capacity for taking fish as compared with other boats. The method will be detailed in the final report. The labor of such treatment was great, but the result gives an approximate idea of the fluctuation in "abundance" of the fish even when relatively few boats are considered. Other minor causes of variation could not be guarded against, and are undoubtedly the sources of certain discrepancies. In the accompanying charts the rise and fall of the catch as the season of 1916 progressed is shown by broken lines, and that of the temperature by the unbroken lines.

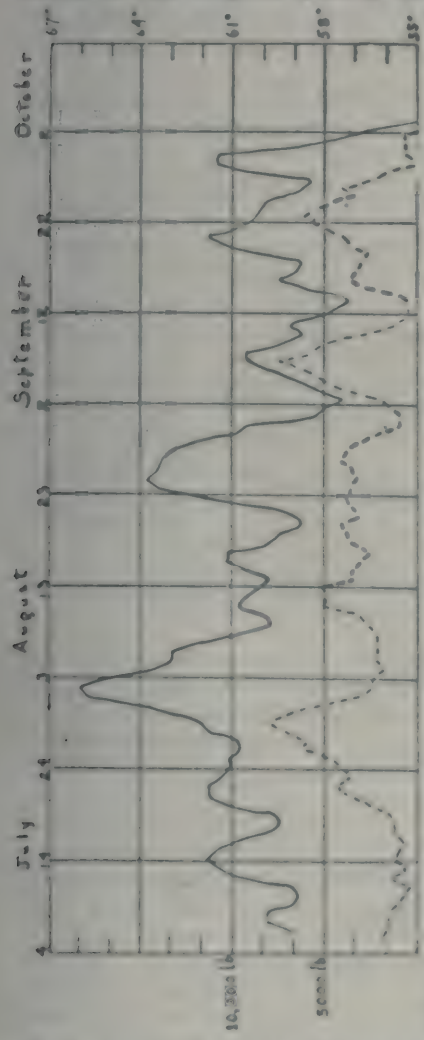


Fig. 64. Comparison of catch and temperature in the region of San Diego. Unbroken line—mean minimum temperature. Broken line—catch per boat.

In figure 64 the relationship between the given curves needs no explanation, but in considering figure 65 certain things must be borne in mind. The first part of the catch is compared with the temperature curve at Avalon, as more representative of the locality in which the catch was taken, but as a matter of fact it probably came from too many regions to be strictly comparable to the temperature of any one locality. The general course of the curves is the same, however. For comparison with the latter end of the season, the temperature at Santa Barbara is taken, because of the tendency to fish in northern waters at that time, although there was not, in 1916, the usual run at Santa Cruz Island. In

order to render more lucid the agreement between the temperature and catch in September both Avalon and Santa Barbara curves are utilized for that period. The essential agreement between the minor high and low points of the three lines in that month may be easily seen in addition to the fact that both temperature and catch were steadily falling. Nevertheless, the agreement in figure 65 must be considered as being necessarily less complete than that in figure 64, because of the greater diversity in the origin of the catch.

The correlation is, however, remarkable, and can not be regarded as showing less than an intimate relationship. Most significant, perhaps, is the fact that a rise and fall in the temperature within the comparatively brief time of ten days is echoed by that of the catch. There can not be any doubt whatever that the catch fluctuates with the temperature

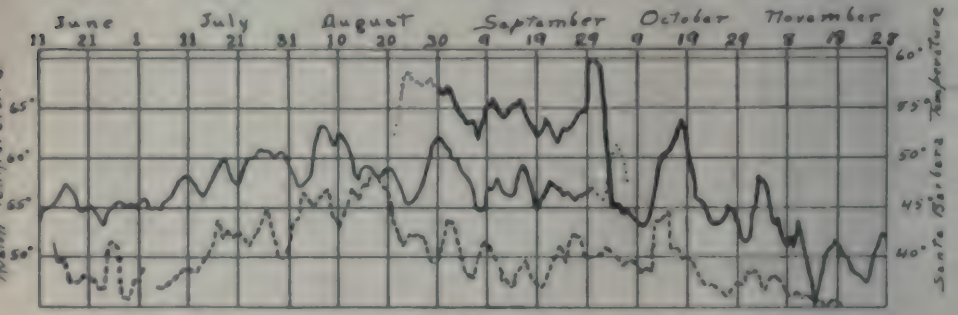


Fig. 65. Comparison of average catch of boats from Los Angeles County, with mean minimum temperatures at Avalon and Santa Barbara (city). Unbroken line to left—Avalon temperatures. Unbroken line to right—Santa Barbara temperatures. Broken line (lower) —average catch per boat.

itself, or with certain things connected with its rise and fall. The step to an explanation of the disappearance of the species during the winter is easily made, for it is hard to see wherein a brief period of low temperatures varies from winter conditions, save in duration and intensity. It would appear logical, then, to ascribe the disappearance of the fish to climatic conditions, rather than migration.

There remains, awaiting explanation, the fact that fish are caught in certain areas at times when none are caught in others. This does not mean total absence, but simply such a difference in abundance as to attract the fishermen away from one region into another. It is well known that the last of the season of fishing is spent in more northern waters, such as those around Santa Cruz and Anacapa islands. Not so well known is the corresponding fact that, in 1916 for instance, September was warmer than August near Avalon and Santa Barbara, and that the reverse was true at San Diego. The summer season came later—lagged in other words—in these more northern districts, a fact which is true of the normal temperatures as given in the United States Weather Bureau Reports for those localities. The lag was still more pronounced in 1916 at San Luis Obispo, farther north than Santa Barbara.

In observing the catch for 1917, some good examples of the varying catch in accordance with the temperature have been found. Although the total catch for the year has not as yet been compared with the temperature, it may be permissible to give portions which are approxi-

mately correct. During the first days of August, until the fourth, inclusive, the notes kept by the writer record the fact that there was a "run" of fish at Anacapa and Santa Cruz islands. This ceased about the fifth and the fishing fleet moved to the southward, catching fish nearer Santa Catalina Island, until by the eighth almost all the catch came from the vicinity of Catalina. These facts were obtained through personal interviews with the fishermen when the fish were unloaded at the canneries, and do not mean that all the fish were taken in the said localities, but that the majority of those taken by the fleet from the northern canneries were. In the accompanying plate (figure 66) the curve for the mean minimum temperature at Avalon (Santa Catalina Island) is given by means of a dotted line, that of Santa Barbara (for the vicinity of Santa Cruz and Anacapa islands) by means of a line of dashes, while the catch is represented by an unbroken line. The temperatures are those given on the daily weather charts for Santa Barbara, and will undoubtedly be subject to certain corrections, but are nearly enough correct to be truthful. The curves are smoothed by averaging in threes, an operation not affecting the variations under consideration. It will be noticed that when the catch of fish came from Santa Cruz waters the Santa Barbara mean temperature was high, but when the catch came from the southward, the same temperature fell decidedly below that recorded at Avalon. The coincidence is too plain to be illusory.

Another similar case is to be seen in the "run" of fish from Santa Cruz waters in the last of August. In considering the plotted curves given in explanation of this (figure 66), it must be borne in mind that the minimum temperature of the air does not indicate absolutely the temperature of the water, but simply probably its fluctuations. It should not be expected that the curves of Avalon and Santa Barbara temperatures be coincident, for the mean minimum temperature at Santa Barbara is normally less than that at Avalon, so that when the two do coincide that at Santa Barbara must be considered proportionately higher than at Avalon. After August 6, and up to August 22, the receipts from Santa Cruz waters were small, forming but a small portion only of the total, but the rise in catch subsequent to that was due almost in its entirety to an influx of fish from Santa Cruz. A certain amount came from San Diego just previous to the twenty-second, but this will not enter into the consideration of the locality of the catch in northern waters. By comparing the temperature records it will be seen that the first falling off in the catch after the thirteenth resulted from or accompanied a falling temperature at Avalon, which continued low throughout the month. The increase in the catch at Santa Cruz accompanied a rise in temperature there (at Santa Barbara) and not at Avalon. In conjunction with the condition remarked on in the foregoing paragraph, it will be seen that this indicates that where the temperature at Santa Barbara (for the Santa Cruz region) approaches or exceeds that at Avalon the catch comes from Santa Cruz waters. This is not true of the earlier part of the season.

The consequences of such an obvious correlation are far reaching. Certainly the hypothesis of migration can not longer depend on the shifting origin of the catch for support, although just as truly it is still probable that a migration does occur. Until some basis for supposing it to take place is brought forward, however, it should not be utilized to explain the distribution of the species, or its absence during the winter months. There is as yet no distinction to be seen between a temporary disappearance during the summer season and that during the winter. The causes as far as we know them, which operate to

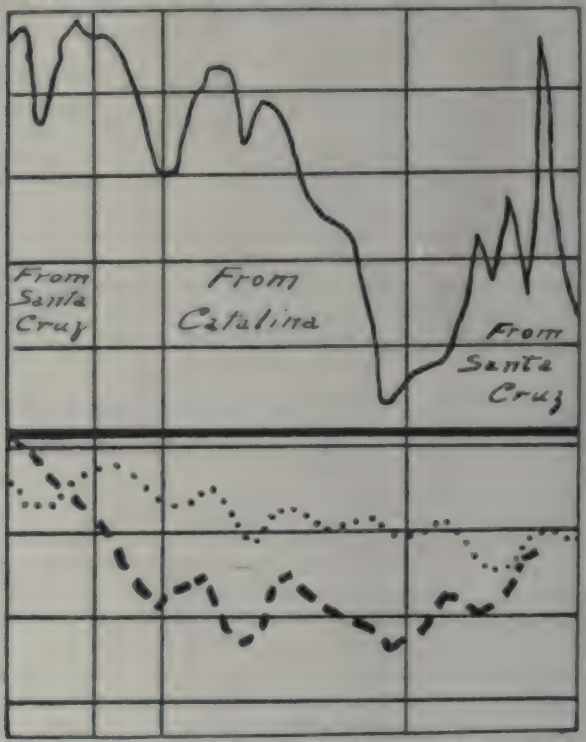


Fig. 66. Comparison of total catch of boats, with mean minimum temperatures at Santa Barbara (line of dashes) and Avalon (dotted line), showing derivation of main catch from Santa Cruz region when temperature at Santa Barbara increases relatively to that at Avalon. (Data as to catch from Canner's Clearing House.)

banish the fish from our ken, are precisely the same in both cases, except that those of winter are more extensive and correspondingly more effective.

It is possible to explain the disappearance and appearance of the albacore, by ascribing to it movements in pursuit of food. It must be shown, however, that the movements of its food (largely other fishes) are just as closely correlated with the climatic conditions as are those of the albacore. Moreover, it may be easily shown that food is not

absent from our waters during the winter months, as witness the beginning of the sardine canning season after the closure of that of the albacore. It would be unwise to in any way deny the possibility of such an indirect connection between the albacore and the climatic conditions, but there are certainly many obvious difficulties still left for solution before such can be established.

Although there is also much to be done before the direct influence of temperature on the albacore can be shown, it is possible to find many facts tending to render the existence of such very probable. The effect of temperature on the activity of cold-blooded animals has long been recognized. The lessened rate of digestion and of metabolism in the reptiles and amphibians results in the obvious and striking torpidity, the greatly lessened demand for food and for oxygen during periods of cold. The pronounced effect of lowered temperatures on digestion and physiological activities has been repeatedly shown in the laboratory. Not quite as well known, perhaps, as the effect of cold on land animals, is its effect on fishes, but gradually accumulating evidence points unmistakably in that direction. The lessened catch in line fisheries in the winter months, the fact that certain fresh water fishes lie torpid in the sand or mud during cold periods, and the now well-known and remarkable evidences of decreased rates of growth during the winter left on the scales of fishes, all indicate that the effect of temperature on cold-blooded animals is just as pronounced and universal in the water as it is on the land. If the effect is resultant from the direct influence of temperature on chemical reactions, and if an accurate and sensitive register of the activity of an animal is at hand, the variations should be as closely correlated with fluctuations in temperature as are those of a chemical reaction, or of a physiological experiment in the laboratory. As has been previously noticed, the albacore fishery is one remarkable for its dependence on the hunger and activity of the fish, and involves the presence of the albacore in the superficial strata of water—if not continuously, at least temporarily. A very slightly diminished activity would undoubtedly be mirrored in the catch.

It should not be forgotten that, because of the multiplicity of factors entering into the life of a species of fish, the probabilities are great that the catch is not an absolutely accurate and sensitive register of the direct action of the temperature, if such is present. Nor is it improbable that the catch is dependent on things which may on their part be correlated with temperature changes. Hence, although it is not to be denied that the discovery of a correlation between catch and temperature is a step toward a solution, the placing of undue emphasis on temperature fluctuations as indicative of the success or failure of the commercial fishery is earnestly deprecated.

The present paper is intended above all as an indication of what might be discovered if adequate facts and statistics were at hand. It is to be hoped that endeavors to obtain such data will meet with the earnest cooperation of those most interested, the canners and fishermen, for without such, progress will be greatly hindered.

MOUNTAIN LION HUNTING IN CALIFORNIA.

By Harold C. Bryant.

It is a well-established fact that the mountain lion or cougar is the most important enemy of deer. Those who have studied the problem believe that a single mountain lion kills an average of one deer a week throughout the year, thus making a total of at least fifty victims annually. A lion often kills more than it is able to eat. There are records of one lion having killed three deer in a single night, and large deer appear to fall prey about as often as small ones. W. T. Shock followed a male lion for three days in Trinity County and found that it had killed three bucks during that time. It is evident that a lion kills many more deer in a year than many hunters do in a lifetime. This being the case, one of the dependable methods of conserving deer would naturally be the destruction of this enemy. This is exactly what is being done. The California Fish and Game Commission has offered a bounty of $20 for the past ten years as an incentive to destroy the mountain lion, so that deer may become more abundant. During this time bounties have been paid on more than 2,500 mountain lions. The amount so expended, totaling about $50,000, has been considered a wise investment by all those conversant with the subject because of the consequent saving of deer. The bounty on female lions was raised July 1, 1917, to $30. Some of the cattlemen offer additional bounty as a method of reducing the destruction of stock by the lion.

Statistics appear to indicate that mountain lions are slowly becoming reduced in numbers, for in 1908 bounties were paid on 482 lions, in 1912 on 275, in 1915 on 162, and in 1916 on 179. The abundance of mountain lions in different parts of the state is indicated to some extent also by the bounties paid. Thus we find Humboldt County leading with a kill of 493 from the time the bounty was established in 1907 up to 1916; Trinity comes next with 231, Siskiyou 229, Shasta 191, Mendocino 164, and Tehama 146. All other counties show a total of less than 100 lions for the same period. Santa Barbara County has claimed a bounty on 66, which places it in the lead of other counties of southern California. It also would appear from these figures that mountain lions have been more abundant in the northern Coast Range than in the Sierras. The accompanying table (page 165) shows the bounties paid during the years 1915 and 1916.

Although a bounty has been claimed on a total of 2,526 lions up to January 1, 1917, these animals are still abundant in most of the counties named above. Nor, notwithstanding the apparent decrease in numbers, is the mountain lion yet under control, and it continues its depredations, not only on deer, but on domestic stock. D. S. Brock states, "I have known of instances of a single lion killing three large-sized hogs, averaging in weight over two hundred pounds apiece, in a single night; also of one lion killing two large deer in one night. They will occasionally kill a deer, a hog and a calf, and eat only one meal from the lot, not even returning to eat more."

How can these depredations be still further reduced? The answer is: By taking a still larger toll of lions each year. We have two means

of bringing this about. We must either interest a larger number of persons in the problem, or we must encourage those who now hunt mountain lions to greater activity by offering a larger bounty. Both methods will probably have to be used. The following information on the methods of capturing lions has been compiled for the information and guidance of all those desiring to cooperate in the control of this deer slayer. The facts given should interest many mountaineers and sportsmen in a practical method of increasing big game.

Fig. 67. A trapped mountain lion. Photograph by O. F. Bacon.

The destruction of a mountain lion is not an easy task and the amateur is usually quickly outwitted by the animal. Lions are usually killed by mountaineers who know well the habits of the beasts. (This is readily proved by an examination of the claimants for the bounties.) But even though experience is a great aid, there is no reason why the amateur, if he be properly equipped, can not succeed.

A kill made by a lion is more often seen than the lion itself. Tracks and animals killed furnish the best clews to the hunter. The tracking of animals indicates that male lions cover a considerable distance when hunting. One in Trinity County when followed was found to have covered a distance of about twenty miles in three days. The same beat is often used for a long time. As a rule, the animals killed for food are only partly eaten. A male lion seldom covers his kill. The female, on the other hand, especially when hunting for her kittens, covers the kill with earth, leaves and rubbish. As a rule she hunts within a radius of five miles when her kittens are small, making a kill and then leading her kittens to it. The female is accompanied by her young for a considerable length of time; young of two sizes have often been seen with the mother. Carrion is rarely eaten, freshly killed meat being preferred.

We are indebted to several successful lion hunters for the following basic information on the usual methods pursued in hunting mountain lions in this state. This was kindly furnished in reply to a letter of inquiry.

SHOOTING.

Lions are largely nocturnal and so are seldom met with. The few which are shot by the hunter are secured by chance. Successful lion hunting is carried on by trapping or by tracking with dogs.

TRAPPING.

Mr. O. F. Bacon, Cook, California, has been successful in the use of traps. The traps, three in number, are set about eighteen inches from the bait, which is placed in such a position that the traps must be crossed in order to obtain it. Each trap is set level with the surface of the ground and covered first with a piece of cloth and then concealed

with dirt. The chain from each trap is fastened to a near-by log, capable of being dragged by the lion. The entrails of a hog or calf, either fresh or fetid, make good bait. Mr. Bacon states that he has trapped eleven lions in this way. The best success has been obtained during the winter when food is hard to obtain.

Fig. 68. A treed mountain lion in Oregon. Photograph from Salisbury Wild Life Films. (Courtesy E. A. Salisbury.)

TRACKING WITH DOGS.

The method most universally followed is that of tracking a lion by means of trained dogs. The dogs used are commonly known as "varmint" dogs. They are usually mongrels, although fox-hounds are said to be especially valuable.

The type of dog needed is thus described by Mr. D. S. Brock: "Hounds that will trail on an old, cold trail, as well as on a fresh trail, and that will trail through and by bunches of deer, paying no attention to the deer whatever, are necessary for trailing lions. Then you know there is a lion when the dog trails, whether there is a visible trail or not. You want the kind of dogs that will trail ten miles if necessary without quitting."

This method is largely used during the winter season when the tracks are easily found and followed on the snow. "I always hunt for lions in a section where deer are plentiful and then search every bluff and

every pile of rocks. In this way I am sure to cross the trail of any lion either entering or leaving its lair. As a lion is usually after prey when moving, the hunter may find a kill at any point on his trail and strike a fresh trail because the lion has returned for a meal, or he may find the lion in near-by brush or rocks." [JAY C. BRUCE.]

As soon as a fresh enough trail has been found the dogs are put on the scent and are followed by the hunter. If a fresher trail is found this is followed until the lion is treed, after which he is quickly dispatched by means of a rifle. The hunter should approach the treed lion carefully so as to avoid the danger of the lion's escape and the necessity of again treeing the animal.

Fig. 69. Mountain lion killed October 15, 1915, at Heenan Lake, Alpine County, by Martin Nomont.

A typical experience in lion hunting as given by H. C. Chester is as follows: "About ten days ago a lion track was reported to me. I took four of my dogs, three start dogs and one younger one. The trail was four days old the morning my dogs picked it up. The dogs cold-trailed it for three and one-half days. The lion advanced about fifteen miles, but back-tracked and made many circles in making that distance. Each night I called the dogs off and took a new start in the morning. The fourth day at 12 o'clock they took a hot track from where the lion had been feeding on a deer carcass, and by one o'clock they had him treed. During the seven and one half days the lion had killed four deer that I know of, one small deer, one large doe and two very large bucks. One buck the lion killed for pleasure and left lying on the ground untouched. The other three were only partly eaten."

In presenting claims for bounty several years ago, W. R. MacArthur of Beegum, Tehama County, wrote: "These five lions represent a month's hunting and a scope of perhaps thirty-five or forty miles of the roughest country in northern California. I have some fine dogs. We

got every lion of which we found the sign with the single exception of the mother of the kittens, and I hope to get her yet. We hunted the largest of these lions, the male, fifteen days. His track was always too old for the dogs, but we finally struck it one morning fresh, and got him in an hour. In our hunt after this lion we found twelve deer that he had killed—some he had only taken one small feed out of and never returned to them. I know this to be a fact, as we went morning after morning, hoping to strike his track at the carcasses, but a male lion never comes back if he can get a fresh deer when he is hungry. Where

Fig. 70. Mountain lion kittens. From Salisbury Wild Life Films. (Courtesy E. A. Salisbury.)

they have all they want, they take one feed in twenty-four hours, and a large lion will eat a deer in two or three days. On the other hand, a female lion with kittens, of which they have from two to four, hunts for the kittens until they are over a year old, killing a deer and taking a feed out of it and allowing the kits to stay and finish it up, while she gets another. A female lion with two or three kits will eat a large deer in twenty-four hours. It is an easy matter to get the kits if one can find where they have a deer."

"While hunting lions is often strenuous work, which subjects the hunter to severe exposure in rain and snow, the chase is always interesting and exciting, and, in my opinion, much better sport than hunting either deer or bear." [JAY C. BRUCE.]

LION BOUNTIES.

Statement of lion bounties paid by the Fish and Game Commission, 1915 and 1916:

County	1915	1916	Total Nos. Lions to Jan. 1917
Alameda			1
Alpine	1		1
Amador		1	9
Butte			30
Calaveras	3		11
Colusa	1		14
Del Norte	2	9	85
El Dorado		2	38
Fresno	1	1	11
Glenn			35
Humboldt	26	39	505
Imperial	1		1
Inyo	3	1	6
Kern	15	18	132
Lake	8	2	81
Lassen			6
Los Angeles	5	1	25
Madera	10	1	31
Mariposa	2	14	47
Mendocino	7	7	161
Merced			1
Modoc			3
Monterey	8	4	62
Mono		5	7
Napa			3
Nevada		2	5
Orange			4
Placer	1	1	30
Plumas			8
Riverside		3	16
San Benito	2	5	29
San Bernardino	1		14
San Diego	1	1	29
San Joaquin	2		2
San Luis Obispo	10	3	58
San Mateo			1
Santa Barbara	4	6	71
Santa Clara	1	1	12
Santa Cruz			1
Shasta	7	10	194
Sierra			6
Siskiyou	9	9	223
Sonoma		1	15
Stanislaus	1		4
Sutter			1
Tehama	4	1	147
Trinity	4	3	232
Tulare	8	3	63
Tuolumne	7	11	48
Ventura	3	1	28
Yuba			3
Totals	162	179	2,536

BOUNTY.

The constant demand for an increase in the bounty paid by the Fish and Game Commission so that remuneration would be sufficient to make lion hunting worth while, has led the commission to increase the bounty on female lions from $20 to $30 beginning July 1, 1917. All claimants for bounty must adhere to the following requirements:

The entire skin, with evidence of sex attached, of the mountain lion upon which a bounty is claimed, must be sent to the office of the Fish and Game Commission, San Francisco, all express or mail charges prepaid. Where only the scalp is sent or in case the sex can not be positively determined a bounty of but $20 will be allowed. The skin should be either dried, tanned, or otherwise cured before shipment, as green skins spoil quickly, becoming very offensive and losing all value. Offensive green scalps **or skins, or those sent charges collect, will not be accepted.**

All hides and scalps received by the Fish and Game Commission will be destroyed unless full directions are given for return to claimant, or for other disposition. A tag with name of claimant, together with shipping directions thereon, should be attached to hide or scalp. All return shipping charges must be paid by claimant or other **person receiving package.**

A claim must be made for each animal, upon a form provided by the Fish and Game Commission, whereupon must appear the names and addresses of the claimant and three witnesses. This claim must be acknowledged before a notary public or justice of the peace, and must bear the county clerk's certification to the genuineness of the justice's signature. If sworn to before a notary public this will not be required. **Affidavits of witnesses are not required.**

The claim must be accompanied by an account of the pursuit and killing of the lion, giving in detail the method used, number of deer carcasses left by the animal, and such other facts as may be of assistance to the commission in determining the damage done to deer and other game. Claim blanks will be sent upon receipt of **written application to the Fish and Game Commission.**

CALIFORNIA FISH AND GAME

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All material for publication should be sent to H. C. Bryant, Museum of Vertebrate Zoology, Berkeley, Cal.

October 27, 1917.

The study of birds has a remarkable educational value and should be advocated not for the sake of the birds alone, but for the good of the children. It gives to many of them a new outlook, a new interest in life, and develops their observational faculties in the natural way.—*E. H. Forbush.*

HIGH COST OF FISH.

There are three good reasons why Californians have to pay high prices for fish:

1. People in California do not subsist to any great extent on fish as do the people of many foreign countries.
2. Californians seldom eat fish in summertime when large catches are made and when prices are low; on the contrary, demand is increased in winter when large catches are least often made.
3. Many people eat fish on one day a week only. As a consequence, fish dealers have to charge enough on these days to make up for those not sold on other days of the week.

VALUABLE INFORMATION FOR ALBACORE INDUSTRY.

The investigations on the albacore industry instituted by the Fish and Game Commission are bearing fruit. In this number of CALIFORNIA FISH AND GAME (page 153) Mr. Will F. Thompson points out that there is a correlation between the catch of albacore and the temperature. It is needless to state that if this point can be substantiated albacore fishermen will have the information they have desired for so long. The ability to predict the catch and dependable information on the location of the albacore at all times of the year seems an immediate possibility.

BAY REGION FISHERMEN LUCKY.

The far-sighted policy of the Fish and Game Commission in introducing new food and game fishes into the waters of the state is evidencing itself in a new way. Because bluegill sunfish and calico bass were planted in the Sacramento and San Joaquin rivers about ten years ago, the delta region has become a fisherman's paradise. The bluegill sunfish and calico bass now swarm in the sloughs and fishing is reported as excellent in Whiskey, Potato, and many other sloughs. These fish readily rise to a fly. They are game, too, and the same sort of sport which is sought by the fly fisherman can now be obtained within fifty miles of San Francisco. Many believe the bluegill and the calico bass to be better flavored and more palatable than trout. The finest of fishing grounds are therefore accessible to everyone in the bay region. All who will arm themselves with an angler's license, a rod, midget flies, and who choose some "blind" slough at low water, can bring home the limit, and at the same time enjoy sport superior in some respects to that found on the mountain streams.

MILLIONS OF POUNDS OF SARDINES CANNED.

Unheard of catches of sardines have been made along the coast of southern California this past spring. The canneries which heretofore have been idle except during the run of tuna have been busy putting up tons of sardines. Up to the middle of June 60,000,000 pounds of sardines have been canned, this being three times the amount canned during 1916. It is expected that the amount already canned will be doubled by the end of the year. Until recent years the salmon fishery was the largest in the state; later, the sardine fishery forged ahead. In 1916 the tuna fishery of southern California loomed up as the principal fishing industry, 30,000,000 pounds being canned. In 1917 the sardine industry undoubtedly will hold first place.

California sardines are just as good as the imported ones. In fact, one gets more for the money because of the fact that our sardines are of larger size. Most of the California sardines are put up in pound cans retailing at 20 cents, but they can also be obtained in the usual flat cans

Our nation is wisely turning in the food crisis to the resources of the sea. "Old ocean" has a full larder and we can easily draw upon that larder to feed ourselves and our allies as well.

WHALE MEAT—VENISON OF THE SEA

A whale is now valuable not only for its fat, but for its flesh as well. Each California gray whale will produce about ten to twelve tons of fresh meat. Formerly this meat was unutilized; now it finds its way to the markets. During December, January and February, 1917, eight whales were captured off the coast of southern California. Some of the meat from these whales retailed at fifteen cents a pound. Some of it was canned. Although in early days used in part by the whalers for food, in more recent years nothing but the oil has been taken from the whales killed. The meat is more tender than beef, is very palatable and exceedingly nutritious. It should be remembered that a whale is not a fish, but a mammal. Hence it is no wonder that whale meat tastes like tenderloin. The canners of southern California have been anxious to put whale meat on the market under a trade name, because the uninitiated appear to be afraid to try this new food, but the government will not allow it to be mislabeled.

Modern whaling is carried on with a sixty-foot boat, with powerful engines, and the instrument which does the killing is a Norwegian harpoon gun. After a whale is towed into port the whole carcass is utilized even to the bone and skin. The bone can be used in the manufacture of buttons and there is evidence that the skin can be converted into leather. The blubber from an average-sized whale will make about 100 barrels of oil valued at thirty dollars per barrel.

Doubtless we have been missing one of the choicest products of the sea and before long we wil find that whale meat is one of the greatest delicacies, selling at fabulous prices. Now is the time to pass your judgment on the "venison of the sea."

JUSTICE METED OUT.

In view of the miscarriage of justice so often seen when murderers of game wardens escape penalty, we are very glad to report that Nino Lombardo has been sentenced to life imprisonment and the other murderer of Deputy Ray Heacock, Dimmaggio by name, to ten years in San

Fig. 72 Advertising whale meat in Long Beach, California. The whale should furnish cheap and nutritious meat during the present war emergency.

Quentin. The appeal originally made was dismissed and these men are now serving their sentences. A third man implicated in the murder will be tried in October. It will be remembered that Deputies Ray Heacock and Richard Squire were murdered by Italian fishermen while doing patrol duty near Terminus, San Joaquin County, last December.

BROUGHT TO JUSTICE.

John W. Guelph of Sierra Madre recently was fined $50 by Judge McDonald of Pasadena for killing a deer out of season and for killing a spike buck. Neither Mr. Guelph's claim of relationship to the royal family of England nor his contention that the deer were destroying his property saved him from the fine.

IN MEMORIAM.

LEO N. PETTIT.

Mrs. Leo N. Pettit, an employee of the Fish and Game Commission for sixteen years, died at the Roosevelt Hospital, Berkeley, in the early morning hours September 11, 1917.

Mrs. Pettit was one of the most valuable and conscientious employees of the Fish and Game Commission. She entered the service as a stenographer and on account of her earnest application to her work and her peculiar fitness, she was advanced and at the time of her death held the very important position of chief clerk.

All with whom she came in contact were impressed with her thoroughness and ability. A capable business woman and a true friend, she is mourned by her associates and friends innumerable.

Mrs. Pettit is survived by a son, Jack, her mother, Mrs. N. L. Nielson, and a brother and sister.—J. S. H.

THE PASSING OF A PIONEER.

Samuel Nickel, watchman, spawn-taker, fisherman, employed for years by the California Fish and Game Commission, was stricken with paralysis in his cabin on Camp Creek, Siskiyou County, on August 26, 1917. He was removed to a hospital in Yreka, where he passed to eternal rest on the twenty-eighth day of August, 1917. Mr. Nickel was born in Ohio in 1833; came across the plains to California in 1849; engaged in mining in California and Nevada for a number of years. He

Fig. 71. Samuel Nichol, for many years a faithful employee of the Fish and Game Commission in the capacity of watchman and spawn-taker.

moved to Lake Tahoe thirty-five years ago, where he engaged in lumbering, fishing, trapping and pursuits generally followed by mountaineers. He was first employed by the Fish and Game Commission in 1890 as a fisherman for spawn fish at the egg collecting station on Lake Tahoe. He assisted in this work for a number of years. Three years ago he was transferred to the Klamath stations of the Fish and Game Commission, where he was engaged as watchman and spawn-taker up to the time of his death.

Sam Nickel was a lover of nature, a true sportsman, a faithful and loyal friend. The employees of the Fish and Game Commission who were associated with him in his work will long remember his kindly nature and genial disposition. He lives in our memory and in the memory of those who loved him. He leaves a sister and two nieces to mourn his death.

THE CLEAN RECORD.

"There is nothing in all the world sweeter than the memories of an old sportsman whose record is clean, nothing more poignant than those of one whose is not. Let every word and deed said and done in the name of sport be such that as memories they will bring not the least regret. Be patient, be kind, be generous, be fair, that when your hair is white your heart may be warmed by dreams of days in Been-There Land."—*The Conservationist*, March, 1917.

OREGON LIBERATES MANY GAME BIRDS.

The Oregon Fish and Game Commission has enlisted the aid of farmers, ranchmen, and country estate owners in restocking the state with game. Game birds are being reared by private individuals in every county of the state.

The census of game birds liberated in 1916 is as follows: Chinese or ringnecked pheasants, 2,914; bob white quails, 973; California valley quails, 959; mountain quails, 142. As a result of this plan, stimulation of private breeders netted a total of 4,988 game birds.

Not only does such cooperation mean an increase, but it binds more closely into a common cause the public and the State Fish and Game Commission.

BIRD PROTECTION SIGNS DISTRIBUTED.

Those wishing to prevent shooting on their premises will be interested in cloth signs issued free of charge by the National Association of Audubon Societies, which read as follows:

SHOOTING ON THIS PROPERTY IS PROHIBITED.
WAR.

PROTECT THE BIRDS AS A WAR MEASURE!

The food destroyed in America by insects and small rodents would feed the people of Belgium! Birds are the great natural enemies of these pests. The laws of the state and of the nation protect insect-eating birds, but many are being shot wantonly and for food. Report violations to the nearest game warden or to the address given below.

NATIONAL ASSOCIATION OF AUDUBON SOCIETIES
1974 BROADWAY NEW YORK CITY

AGE OF DEER DETERMINED BY TEETH.

In the 1916 Biennial Report of the State Fish and Game Commissioner of Vermont attention is called to a method of determining the age of Virginia deer by their teeth. The Vermont law provides that it is unlawful to kill "an animal of the first year." It is therefore necessary to distinguish fawns from yearlings. A collection of jaws, obtained by a taxidermist, indicates that the length of the jaw and the character of the teeth is a more dependable means of determining age than the number of points on the antlers. The following interesting table gives measurements of nine jaws:

Number	Length of jaw	Number of points	Width of antlers
1	6½ in.	Fawn	Fawn
2	8 in.	2 spike horn	8 in.
3	8¼ in.	4	11 in.
4	8¼ in.	6	14 in.
5	8¾ in.	6	17 in.
6	8¾ in.	8 heavy	20 in.
7	9¼ in.	10 heavy	19 in.
8	9¾ in.	10	22 in.
9	10 in.	8 uneven	23 in.

Although of possible value as a means of ascertaining the age of a deer already killed, we fail to see how this method can

be employed in judging the age of deer in the wild, a necessity under the present Vermont law.

AN OBJECT LESSON.

Vermont has again demonstrated what conservation can do for deer. The last report of the Fish and Game Commissioner states that 6,042 deer (bucks and does) were killed during the open season of 1915. When it is known that the area of Vermont is less than one-seventeenth that of California, we are led to ask the question: "Why is our estimated kill of 12,000 buck deer per year not larger?" The total absence of mountain lions in Vermont may in a measure account for the discrepancy. The toll taken by mountain lions in California if added to our kill of deer would materially increase the total.

AMBERGRIS.

The finding by a fisherman upon San Francisco Bay of a mass of material that had the appearance of ambergris led to an investigation whether or not this substance was found along our coast. Upon applying the old test of the insertion of a hot needle to draw forth a peculiar musky scent and to show a fatty consistency, the fisherman's discovery did not prove to be ambergris, and as far as we have been able to find out, this valuable substance has never been procured in quantity on the California coast.

To those not familiar with the word we offer the following facts gleaned from Scammon's "The Marine Mammals of the Northwestern Coast of North America."

Ambergris has for many years been the basis for a great number of perfumes. Although quantities have been obtained sufficient for such use, yet the source of the substance was a mystery for many years. Great masses of a yellowish, translucent substance was found in considerable quantities floating in the Indian Ocean or along its shores; lesser quantities have been found in other parts of the world.

The demand for this commodity is indicated by the high price paid in 1791, $6 per ounce. As early as the sixteenth century it was valued by the English. At that time a queer myth of its source existed in the tradition that ambergris issued from the root of a tree, which shot its roots towards the sea, and later by the washing of the warm waters the gum was cast upon the shore. Somewhat later in the century we find the term "ambergriese" associated with the whale, for one Dr. Thomas Brown attests that great lumps were found by the leviathan and swallowed.

In these same days country doctors resorted to powdered whale's tooth as a cure for smallpox and other diseases. The medicinal properties of ambergris were recognized also, and doses of unadulterated ambergris were prescribed in quantities of thirty grains; indeed, a sailor is said to have tried its efficacy by taking half an ounce.

Ambergris is now known to be the excreta of the sperm whale, a fact well proved by its being composed very largely of the remains of squid.

SCIENCE IN THE INCREASE OF BIRD LIFE.

Thoughtless destruction of birds and a decrease in numbers owing to altered conditions, has brought about an interest in methods of attracting birds. Oftentimes the man who is planning a country home is desirous of knowing how birds may be attracted to his place. The United States Department of Agriculture has been helpful in furnishing several bulletins dealing with food plants. Methods of furnishing an increased food supply during the winter season have also been developed in this country.

However, it has been left to a man in Seebach, in Thuringia, to work out practical measures for increasing bird life in a limited area. This man, Baron von Berlepsch, working on the theory that the most important step for bringing about the successful protection of birds consists in establishing suitable conditions of life and, above all, opportunities for building nests, has evolved a certain scientific practice. The results obtained clearly demonstrate the practical value of the methods used.

Chief among these methods are the planting of shelter woods and hedges and the proper pruning of these to furnish nesting places. In addition, such common sense measures as the leaving of fallen leaves to provide increased food

for birds by furnishing food and hiding places for insects, the placing of brush and woodpiles and the delay of pruning until after the nesting season, are utilized.

Any one desiring to introduce special measures for the protection of birds should see one or all of the following:

"How to attract and protect wild birds." Martin Hiesemann. 100 pp. Witherby & Co., London, 1912.

"Attracting birds." Gilbert H. Trafton. 173 pp. National Association of Audubon Societies, 1974 Broadway, New York City.

Bulletin No. 1, National Association of Audubon Societies, "Attracting birds about the home."

A LETTER TO A GAME WARDEN.

Frequently the Fish and Game Commission and its deputies receive amusing letters. A complaint recently received by Deputy Harris, Yreka, California, reads as follows:

"G. W. Harris, the so culled "white-Injins," are killing a way over their limit

Pretty soon no more Deer aller same Hen's teeth.

Black Klamath injin."

CIVIL WAR VETERANS OBTAIN LICENSES FREE.

At the last legislature both the hunting and angling license acts were amended to the effect that licenses be issued to Civil War veterans at no cost to them. In order to keep the records clear, however, it has been found necessary to issue such free licenses only at the district offices of the Fish and Game Commission at San Francisco, Sacramento and Los Angeles. No licenses will be issued to Civil War veterans at the offices of county clerks or at other places where licenses are ordinarily sold.

THE BOY WITH A GUN.

Whenever I am asked by some bird lover how boys can be prevented from shooting birds with air guns, I reply: "A boy with a gun is like a cat—everything is prey that wears feathers. Here is the only effective remedy: Teach bird study in the schools as a part of the conservation of national resources. Get children organized into bird clubs. A boy is not likely to kill birds if he knows one from another, is interested in their lives, and has done something for the birds and received pleasure from them. The state protects all birds except eight, and you can report violations of the law to the game warden, or to the president of the Audubon Society. But the latter course will avail little, as long as people are ignorant of birds.

"The present game laws are not better enforced because they are not supported by public opinion and because one game warden can not adequately patrol a territory half as large as Massachusetts. If every bird were protected and a property owner allowed to kill only those birds that he found actually doing damage, then every boy or hunter with a gun would not have a practical license to kill every bird he sees, as he does under the present law. Three hawks and one owl are now unprotected, and as a consequence every hawk and every owl are killed for sport. The other day a man in Mission Valley, San Diego County, was killing the harmless fly-eating black phoebes because he "thought they were butcherbirds." Can you tell me what damage butcherbirds could do that man? They gorge themselves on Jerusalem crickets, which are enemies of every root crop. Change the present law. Make every policeman, constable, and forest ranger a game warden. Have a couple of mounted policemen to ride over the county as they do in Canada. Teach bird study in the schools. Then you will get somewhere with bird protection."—C. D. Scott.

REMEMBER THE BUFFALO.

Commercialization of wild life leads to extermination. Evidence of the extent to which the buffalo was commercialized in former times is to be found in the following poster issued by the Burlington and Missouri-River Railroad Company and distributed in England in 1871. We are indebted to Mr. Kenneth Watson, a prominent insurance man of San Francisco, for the privilege of seeing the original. The poster is a most interesting side-light on the causes of extermination of one of America's largest and finest game mammals.

GRAND BUFFALO HUNT.

A Grand Buffalo Hunt will be held in September next, on the prairies of NEBRASKA and COLORADO, United States, and through the magnificent valley of the Republican River, the rich alluvial feeding grounds of the Buffalo.

The valley of the Republican River possesses some of the most varied and magnificent scenery in America; the wild pastures are rich in grasses, and it is most beautifully wooded and watered by clear streams and rivulets. The southern portion of Nebraska, through which the Republican Valley passes, will bear comparison either for climate, soil or picturesque scenery, with any country.

The Burlington and Missouri River Railroad Company own some millions of acres of land; is one of the most wealthy and influential Corporations in the Western States of America; and will aid and assist this Hunting Party in every way, in order that the Sportsmen of England may see the Western Country, and, on their return, be able to corroborate the statements as to climate, accommodation provided by them, and the gigantic advancement made in cultivation and general improvements in so new a country, for at least 200 miles from the Missouri River.

Mr CHARLES S. DAWSON, of the Burlington and Missouri River Railroad Company, who left England last April, has made arrangements in Nebraska with Mr WILL MANLEY and a corps of Western Hunters, Trappers, and Scouts, of the Western Frontier of the United States, for a Grand Hunt on the plains of Nebraska and Colorado, and in the valley of the Republican River, where Buffalo, Elk, Antelope, Red Deer, Barren Otter, Wild Turkey, Prairie Chicken, &c., abound in large numbers; the Buffalo in herds of from 5,000 to 10,000. THERE ARE NO HOSTILE INDIANS IN NEBRASKA WHATEVER; friendly chiefs of the Otoes, Pawnees, &c., will accompany the party.

The Commissariat will be in charge of Mr. J. N. Townley, of the Tichenor House, Lincoln, Nebraska, at which place the passengers will rest a day after the journey, while preparations for the Hunt and leave their heavy baggage. Mr. Townley will be accompanied by an efficient corps of cooks, men to pitch and strike camp, and attend to baggage. Sportsmen will be provided with army tents and beds during the Hunt, and everything generally found in a first-class Hotel. There will be servants to take care of the horses, and in fact all arrangements have been made to give the Hunting party the greatest amount of pleasure with the least possible trouble.

The party will be accompanied from Liverpool, by Mr. Dawson. His assistants will take charge of the baggage through to Lincoln, Nebraska.

The magnificent Steamer *Atlantic*, of the White Star Line, leaving Liverpool, 12th September, has been selected to convey the Hunting Party to New York, whence they will be taken by Express Train of Pullman Palace Drawing Room and Sleeping Cars, via Pennsylvania Central R. R. across the Alleghany Mountains and Indiana to Chicago, where time will be allowed to view the latter City—then across the highly cultivated Prairies of Illinois to Burlington, Iowa, at which point the Mississippi River is crossed, where the cars of the Burlington and Missouri River Railroad Company, to which a Dining Room Car will be attached, will convey the party over the mighty Missouri and the State of Iowa to Lincoln, Nebraska.

Parties may, if they wish, return by way of "Niagara Falls," and thus see one of the grandest sights in the world.

Waggons will be provided for the conveyance of any trophies of the chase, such as Buffalo Skins, Elk Horns and Antlers in limited quantity.

The mind of artistic looks to America as the best field wherein to investigate the changes which have affected this earth. In Europe, and more particularly in Great Britain, this is difficult to do. It is where nature is still free that he seeks to discover the great facts of natural progress. The anthropologist can find there ample opportunities for pursuing objects of interest to him; for there is no land so rich in preliminary lore, and abounding in so many relics of a by-gone age and race, as that of the United States of America. The sportsman has there a field of nature's own creation on which to roam in pursuit of his healthy and invigorating pleasures; and where can the lover of scenery find greater, grander, lovelier views than are to be found on the Continent of America?

FARE — For The Round Trip of about Seven Weeks including every expense, except Wines, Liquors, Cigars, Guns, Rifles, and Ammunition, 90 Guineas.

The arrangements will be such as to ensure the comfort of Ladies joining the party, but the charge for Ladies will be 100 Guineas each.

For further particulars apply to

The Burlington and Missouri-River Railroad Company,

16, SOUTH CASTLE STREET, LIVERPOOL;
25, MOORGATE STREET, LONDON;
70, ROBERTSON STREET, GLASGOW.

C. R. SCHALLER.

LONDON: CORNMARKET, 76 AND 77, OXFORD STREET, AND MORDEN ROAD, BLACKHEATH.

CANNING SEA MUSSELS.*

The sea mussel is of all the shellfish particularly adapted for canning. Unlike the oyster, it remains tender and retains its full flavor when subjected to the high temperatures necessary to prepare it in this way. The process which has been devised as most feasible is as follows:

The mussels when taken from the collecting boats are rapidly picked over by hand to eliminate any dead or unhealthy ones which may be present, as well as the coarse adhering debris. Then they are placed in a cleaning apparatus. * * * It consists of a rectangular box 2 x 2 x 3 feet, which revolves on its long axis. The ends of the box are of solid yellow pine and are firmly held in place by four pairs of braces 3 feet long, 2 inches wide, and ¾ inch thick. Three sides of the box are inclosed with ¾-inch mesh galvanized wire netting. The fourth side has a door 8 inches wide, running the length of the box. The door is clamped firmly in place by means of a lever, which is swung over it. The rest of the side is filled in with parallel strips of wood placed ½ inch apart. The projecting ends of the axis rest on the walls of a trough 1½ feet deep, in which there is running sea water. A crank at one end serves as a means to rotate the cage.

About one bushel of mussels is placed in this cleaning apparatus, which is set in rotation at the rate of thirty revolutions a minute for fifteen minutes. The treatment cleans off from the shells all clinging seaweeds, sand and debris, besides breaking open the shells of dead mussels and washing away the injurious substance contained within them. In the experimental work this method of cleaning mussels proved very effective. For cleaning on a commercial scale the device may easily be constructed on larger dimensions and operated by means of steam or water power.

After this treatment the mussels are removed and rinsed off with clean water. They are placed in a chest and subjected to live steam for from five to ten minutes, or until the shells begin to open. They are next emptied out into shallow pans to cool and the natural liquor which has escaped into the chest is preserved in a separate dish. As soon as they are cool enough to be handled, the mussels are shucked and the horny "beard" removed, the meats and liquor being preserved in separate dishes.

While the liquor taken from the steam chest and that taken from the mussels during the process of shucking is filtering through a fine-meshed cloth, the mussel meats are packed in glass jars or bottles. The filtered liquor is brought to a boil and two ounces of salt are added for each gallon. The jars containing the meats are then filled with the boiling liquid and sealed. To insure complete sterilization, the sealed jars are placed in a steam chest and subjected to five pounds pressure for fifteen minutes. They are allowed to cool down slowly and when the temperature has fallen to about 100 degrees F. they are removed and set aside for future use.

Persons wishing to can mussels for use in their own homes and who lack the facilities described in this process, may do so by modifying the method in the following way: After thoroughly cleaning the outsides of the mussels by means of a stiff-bristled brush, rinse them in clean water and place them in a large, closely-covered kettle with a little water covering the bottom—about one cup of water to each gallon of mussels. Place on the stove and bring to a boil, continuing the cooking for about fifteen minutes, or until the top shells have opened. Pour out the liquor that has collected in the bottom of the kettle and preserve it in a separate dish from the mussels. Shuck the mussels, being careful to remove the byssus or horny tuft of threads growing out from the base of the foot. While the liquor is filtering through a fine-meshed cloth pack the meats in pint or half-pint glass jars of the ordinary household type. To each quart of the filtered liquor add one heaping teaspoonful of salt and bring it to a boil. Pour the boiling liquid over the mussel meats, filling the jars to the brim, and then quickly clamp or screw on the lids. The jars should next be placed in a large vessel, such as a washboiler, containing boiling water, and left to boil for at least half an hour. At the end of this time the vessel with its contents should be removed to the back of the stove and allowed to cool. As soon

*The Food Value of Sea Mussels, by Irving A. Field, in the Bulletin of the Bureau of Fisheries, Vol. XXIX, 1909, pp. 111–118.

as convenient the jars may be removed and the tops tested to see that they are sealed air-tight. Treated in this manner, the mussels ought to keep for many months and preserve their natural flavor. When desired for use on the table they may be prepared according to almost any of the methods employed in preparing the fresh mussels for food.

SWORDFISH AND TUNA FISHING EXCELLENT.

The famous game fishes of southern California—the tuna and broadbill swordfish—have been furnishing excellent sport this season. At Catalina Island during June but one tuna was hooked. During July fourteen were caught, and in August 291. During the same period eight broadbill swordfish were landed on regulation tackle, and several marlin swordfish took hooks, but succeeded in getting the better of the anglers.

PETS, THEIR HISTORY AND CARE.

Every person interested in keeping pets has doubtless noted the lack of printed information on their care. At last there has been published an excellent book which contains just the information desired by the average person interested in pets. The author of the book, which is entitled "Pets, Their History and Care," is Mr. Lee S. Crandall, assistant curator of birds, New York Zoological Park, a man who has had wide experience in the care of birds and animals in captivity.*

The introductory paragraph of the preface aptly points out the value of fostering the interest of children in keeping pet animals. Mr. Crandall says:

"Every normal child, of whatever race or creed, is born with an innate love for wild things. If allowed to languish from lack of intelligent parental interest and supervision, this natural instinct is gradually lost or degenerates into the unintentional cruelty of ignorance. Properly fostered and developed, it is certain to exert a beneficent influence on the trend of developing character. Given scope and sympathetic guidance, the young mind is trained to observe and appreciate the subtle ways of nature, an accomplishment which, in later years, will prove, if nothing more, a welcome diversion. The sterling qualities of kindness, responsibility and regularity are required, and many of the problems which perplex the adolescent adjust themselves normally by constant contact with reproductive life."

With the exception of a few such animals as the lamb, calf and colt, whose care is well understood, practically all those birds and mammals which make successful pets are given treatment. Although certain birds, such as pheasants, cranes and waterfowl, can not be considered as pets in the sense that they may be fondled, yet because of the fact that they are kept for ornaments and their proper treatment is not well known, they are included. The reader is asked to rely upon works of natural history for detailed description and for wild habits, in that captivity is the keynote of the book.

In each chapter emphasis is placed on general care of the different groups of animals and birds and special treatment, including feeding, is given under the head of each species. Under mammals, chapters are devoted to dogs, cats, rabbits, guinea pigs, rats and mice, and small wild animals. Under the section devoted to birds can be found information on pheasants, peafowl, quail, pigeons, doves, cranes, waterfowl, hawks and owls, parrots, cage birds, canaries and bantams. Another section is devoted to reptiles and batrachians, and a fourth to the aquarium.

Although recommending that any creature seriously ill should be treated only by a trained person, yet a valuable chapter is devoted to birds' diseases. It is interesting to note that the medicines used are, without exception, the same as those used for like ailments in man.

The appendix contains a brief but interesting statement of the "Theories of Breeding," attention being called to Mendel's law, to selection, and to inbreeding. A valuable list of practical reference works concludes the volume.

Of particular interest to the casual reader are some of the facts regarding the history of some of our commoner pets. Here we find mention of the wild ancestors of the dog, cat, guinea pig, and other animals and birds. To the child or the grown-up who wishes answers to such questions as "Where did our dogs come

*Pets, Their History and Care, by Lee S. Crandall; Henry Holt & Co., New York, 1917; 373 pp. illus.

from?" "What does a monkey eat?" "What type of cage is best for young birds?" "How are young ducks reared?" "What species of parrot is the best talker?" "What other birds besides parrots learn to talk?" and "What sort of canary is the best singer?" now have their questions answered in "Pets, Their History and Care."—H. C. B.

CALIFORNIA CONDOR ON EXHIBITION IN GOLDEN GATE PARK, SAN FRANCISCO.

Although the condor is the largest land bird that flies in California, and was once so plentiful that everyone was acquainted with the bird, yet at present it is limited to a few districts, and there are but few individuals who see the bird.

During June, 1917, a vaquero named Rocky Digges discovered one of these huge birds feeding on the flesh of a dead horse in Monterey County. He waited until the bird had become fully gorged with food before attempting to lasso it. Before the condor could take its needed run to rise in the air, his lariat fell around its neck, and the bird was taken captive.

As an earnest attempt is being made to carefully protect this bird, it was confiscated by the Fish and Game Commission and turned over to the California Academy of Sciences. The academy in turn had it placed in the aviary at Golden Gate Park, San Francisco, where thousands may view the fine living example of California's largest bird.

FUNCTION OF THE GAME AND FISH DEPARTMENT.

The function of the Game and Fish Department is to coordinate and employ all agencies that tend to arrest the destruction of wild life and to encourage every attempt at building up this resource. It should not be merely a police department, but an administrative branch of the State government engaged actively in constructive work in cooperation with all other organizations and agencies.—*Fins, Feathers and Fur*, December, 1916.

USUAL REPORTS NECESSARILY OMITTED.

The death of Mrs. L. N. Perrit, chief clerk in the San Francisco office, an efficient and loyal employee of the Fish and Game Commission, has made it impossible to publish the usual financial reports. They will appear in the next number.

HATCHERY NOTES.

W. H. SHEBLEY, Editor.

TROUT FRY DISTRIBUTION, 1917.

During the month of May the distribution of trout fry from the different hatcheries was commenced. This work has been completed at most of the smaller stations, and the hatcheries closed for the season. At the larger hatcheries, however, distribution operations will not be completed until the middle or latter part of October.

SNOW MOUNTAIN STATION.

After completing the egg collection operations at the Snow Mountain Station, during the latter part of May, it was found that in excess of 6,000,000 steelhead trout eggs had been taken. The eggs were "eyed" and shipped to Mount Shasta, Mount Whitney, Fort Seward and Ukiah hatcheries, to be hatched, reared and distributed in the streams suitable for this variety of trout. Two hundred thousand of the eggs were retained at Snow Mountain Station, where they were hatched and distributed in several of the tributaries of South Eel River, above the Snow Mountain dam.

UKIAH HATCHERY.

A half million steelhead trout eggs were shipped from Snow Mountain Station to Ukiah Hatchery, and during the months of June and July were given a wide distribution in the waters of Mendocino and Sonoma counties.

FORT SEWARD HATCHERY.

Steelhead trout eggs to the number of 1,250,000 were shipped to Fort Seward Hatchery from the Snow Mountain Station, and in addition to this number, 150,000 rainbow eggs were received from the Domingo Springs Station in Plumas County. The work of distributing the resulting fry was commenced during the fore part of July. Most of the fry have now been distributed, the many streams of Humboldt County receiving most of the fish. A couple of shipments are yet to be made to streams in Del Norte County, but this work will probably be completed by the middle of September.

BROOKDALE HATCHERY.

The Brookdale Hatchery was closed about the middle of July after completing a very successful season. Most of the steelhead trout eggs collected at Scott Creek Station and "eyed" at Brookdale Hatchery were shipped to the Mount Shasta Hatchery, but approximately 900,000 were hatched out at Brookdale and distributed in the streams of Santa Clara and Santa Cruz counties.

ALMANOR HATCHERY.

The half million rainbow trout eggs hatched at Almanor Hatchery were distributed during the month of July in the streams of Lassen County and tributaries of Lake Almanor, Plumas County. The hatchery was closed and the crew was transferred to the Domingo Springs Station on Rice Creek, Plumas County.

DOMINGO SPRINGS STATION.

The take of rainbow trout eggs at Domingo Springs Station amounted to 870,000. A portion of them were shipped to the Mount Shasta and Fort Seward hatcheries, and the remainder were hatched and distributed in some of the lakes and streams of Plumas and Lassen counties. The crew is at present engaged in making repairs and improvements to the racks, traps, and living quarters of the assistants. The eyeing station is being moved to a more desirable location where a better supply of water from Rice Creek may be obtained.

BEAR LAKE HATCHERY.

The Bear Lake Hatchery was closed August 25, after completing a very successful season. The 875,000 rainbow trout fry hatched at the station this season were given a wide distribution in the streams of San Bernardino County and in Big Bear Lake. The commission is planning to increase the size of the egg collecting and eyeing station at Bear Lake this fall, and if a lease can be obtained from the heirs of the North estate (on whose property the station is located) for a term of years, the new station will

be constructed before the winter storms set in. It is planned to construct a 48 trough eyeing station and suitable living quarters for the employees. With adequate facilities for collecting and "eyeing" the eggs, it is expected that a large number of rainbow trout eggs will be taken from Bear Lake next season.

TAHOE HATCHERIES.

Egg collecting operations at the Tallac Station this season were very successful, 4,250,000 black-spotted eggs being taken. Of this number 1,000,000 were shipped to Mount Shasta Hatchery, 250,000 to Mount Whitney Hatchery, 775,000 were transferred to the hatchery at Tahoe City, and the balance were hatched at the Tallac Hatchery. The resulting fry were given a wide distribution in streams of El Dorado County and in streams tributary to Lake Tahoe in El Dorado and Placer counties. The eggs shipped to the hatchery at Tahoe City were hatched and the fry are now being distributed in the streams of Placer and Nevada counties. A shipment of 250,000 rainbow trout eggs was made from the Domingo Springs Station to the Tahoe City Hatchery, and the resulting fry will be distributed in streams and lakes in the vicinity of Lake Tahoe and in the Truckee River.

WAWONA HATCHERY.

Wawona Hatchery was opened for operations during the fore part of May and 75,000 steelhead and 150,000 rainbow eggs were shipped to the station from the Snow Mountain and Mount Shasta hatcheries. The resulting fry were distributed in the streams of the Yosemite Valley during the latter part of July and the fore part of August. The station was closed on August 18.

MOUNT SHASTA HATCHERY.

The two fish distribution cars have been busily engaged in the work of distributing the fish from the Mount Shasta Hatchery, and it is expected this work will be continued well into the month of October. Approximately 10,000,000 trout fry will be distributed from Mount Shasta Hatchery in the streams of California this season. After the completion of the trout distribution work, the quinnat

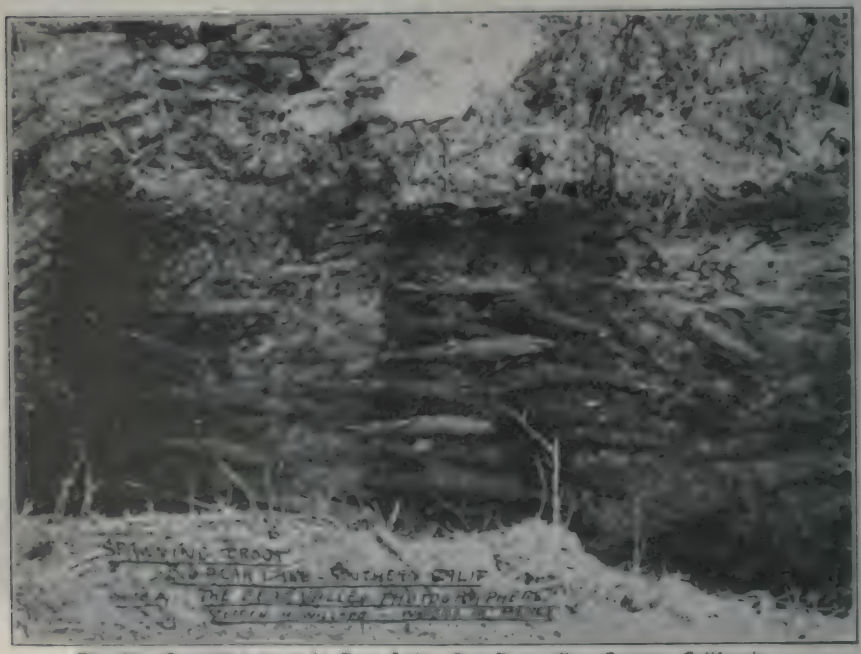

Fig. 73. Spawning trout in Bear Lake, San Bernardino County, California. Photograph by Messrs. Willard and Pierce.

salmon, which are being retained in the large rearing ponds and lakes, will be distributed in the upper reaches of the Sacramento and Klamath rivers.

MOUNT WHITNEY HATCHERY.

On September 23 distribution car No. 01 will be detached from the Mount Shasta Hatchery distribution work, and will be sent to Mount Whitney Hatchery to commence the distribution of the trout fry from that station. The 250,000 black-spotted and 750,000 steelhead trout eggs which were shipped to Mount Whitney Hatchery early in the season have hatched, and the resulting fry are exceptionally strong and healthy. Four hundred fifty thousand rainbow trout eggs were taken at the Rae Lakes Station, an auxiliary station to Mount Whitney Hatchery, and were transported by pack animal to the hatchery. It was not until very late in the season that the spawning crew was able to get into the Rae Lakes section to open up the station, owing to the heavy fall of snow which blocked the Oak Creek Pass. The take of eggs was therefore very light, as a considerable percentage of the fish had already spawned.

As soon as the distribution car arrives at the Mount Whitney Hatchery, distribution operations will be commenced. The fish will be shipped to applicants of southern California and of lower San Joaquin Valley counties.

SCREEN AND FISHWAY INVESTIGATION.

During the past three months, the screen surveyor has been engaged in making new surveys of all the canals and ditches in the counties of Butte, Contra Costa, Fresno, Kings, Lassen, Madera, Mariposa, Merced, Modoc, Shasta, and portions of Siskiyou, Stanislaus, Tehama and Tulare counties, and preparing notices to be served on the owners of the same to install suitable screens in accordance with the new law passed at the last session of the legislature.

The ladder surveyor has made a number of surveys and prepared plans for fish ladders to be installed over dams in the counties of San Luis Obispo, El Dorado, San Mateo, Napa, Shasta and Butte. The fish ladder over the Alta Bert Dam, property of the Trinity County Water and Power Company, in Trinity County, was completed during the month of August.

COMMERCIAL FISHERY NOTES.

N. B. Scofield, Editor.

CALIFORNIA'S COMMERCIAL FISHERIES.

Commercial fisheries of California are enjoying general prosperity and it is now certain that the catch for 1917 will reach 200,000,000 pounds, which is about double that of 1916. The salmon catch has not come up to expectations, but the tuna catch will be about double, and with the present high prices the pack will have a wholesale value of over $5,000,000.

The greatest development has been in the sardine fishery. The tuna packers of southern California last winter took up the canning of sardines as a side line to keep their canneries busy. On account of the long fishing season and the low cost at which sardines can be obtained, there is more profit in canning sardines than tuna. During the first six months of 1917 over 600,000 cases of sardines were packed and, as the last six months of the year are usually the best, the pack should reach 1,000,000 cases, with a wholesale value of $7,000,000.

Ours is a true sardine, and if properly packed is the equal of any, even the celebrated French sardine. So far the larger fish have been canned to the greatest extent, although a few canneries put up the smaller fish in olive oil in ¼-pound cans. These compare favorably with the best imported article.

The sardine packers of this state are alive to the fact that the industry is still in its infancy and that within a few years the pack can be increased to 3,000,000 cases. In order that the industry may be built up solidly on its merits and on the quality of the pack, the packers are endeavoring to form an organization along the lines of an association formed by the sardine packers of Maine, when it became necessary to put out a better quality

and a more uniform pack to save themselves from financial ruin. The proposed organization will have a system of inspection so that only prime fish will be packed and rigid sanitary rules will be enforced about the canneries and in handling the fish on the boats. On September 14 a delegation of sardine packers from southern California visited Monterey in a special car, the object in view being to look over the canneries and fishing methods of that section where the packers have had more years of experience. It was also their idea to complete the plans for the new organization, which they propose to make state-wide.

Several companies largely interested in fisheries in both the United States and Alaska have recently been investigating the sardine and tuna possibilities in this state, and it is certain that the next year will see some of them actively engaged in the business in California. Monterey Bay now has six sardine canneries, and it is very likely that this number will be increased in the near future. Two companies have already made application to the Monterey city council for water front space for canneries. According to a local paper, it is believed that large interests are behind the applications. One is said to be Libby, McNeil & Libby and the other the Alaska Packers.

All indications point toward a most wonderful development in the California fisheries for the year 1918.

COMMERCIAL FISHERIES ON THE MENDOCINO COAST.

Within the last year a cannery and two mild curing plants have been established at Noyo, Mendocino County, a mile and a half south of Fort Bragg, which is the shipping point, and if the proper steps are taken toward securing a navigable entrance to the Noyo River several more plants will be established at this point. There seems to be no question as to the supply of fish, and with a proper harbor for fishing boats, Noyo and vicinity will excel Monterey, particularly for salmon, according to fishermen now in this territory.

Up to within a year ago Noyo was practically unknown in so far as commercial fishing was concerned. Because this territory is new to most fishermen and on account of the poor entrance to the harbor the maximum number of boats there this year was only 100, but upon interviewing fishermen working in these waters it was learned that they all intend to return, and predict that double the number of boats will come for the 1918 season.

Shelter Cove, about forty miles up the coast from Noyo, is a very good fishing ground and a fair shelter for the boats during all weather conditions, except a southeaster. Freight boats carry the fishermen's catch to Noyo and return with provisions, gasoline, etc., and because of these boats plying between the fishing

Fig. 14. Fish cannery on Noyo River. New fishing grounds near the mouth of the Noyo River are increasing the fish industry in this vicinity. Photograph by H. O. Beckley.

ground and Noyo the fishermen can remain on the fishing ground constantly, or as long as they choose.

F. D. Small and D. C. Urie, both from Tillamook, Oregon, under the firm name of Small & Urie, have invested about $15,000 in a salmon cannery at Noyo and are equipped to handle 350 cases (maximum capacity) of salmon per day. At the present time they employ twenty-five people and could use a much larger force if they could get the fish, but because of the lack of fishing boats this cannery has never run to its full capacity. The run of salmon begins the latter part of June and ends the latter part of August, and from 600 to 1,000 pounds per boat in a day's fishing is not an unusual catch. This season one boat with two men caught 1,400 pounds in a single day's fishing. The price ranges from 6 cents to 9 cents per pound.

There are also two mild curing plants at Noyo. One, the Columbian Northern Fishing and Packing Company, with F. Klevenhusen of Altoona, Washington, for its president, represents an investment of about $12,000, and has a cold storage capacity of 125 tons. They manufacture their own ice and have a maximum capacity of 1,000 tierces per season. This plant does not operate any boats of its own and must depend upon outside fishermen for its supply. The Pacific Mild Cure Company of San Francisco has a plant here, but its pack was small this season, due mainly to lack of boats.

There were approximately 200 tons of salmon shipped from this territory fresh, beside that which was used by the cannery and the mild curing plants.

JAPAN FURNISHES FISH FOR ARMY.

Japan is furnishing Russia with fish for the use of her army. For the period of one year, from March, 1917, to March, 1918, it is estimated Russia will require 29,000,000 pounds of preserved fish, other than canned fish, in the following proportions:

15,000,000 pounds salted
9,500,000 pounds dried
4,500,000 pounds frozen

The Japanese salmon fisheries in Japan and Kamchatka have had a very prosperous season, and they are expecting to sell large quantities of canned salmon to England. The Japanese are evidently finding a very active market for their salmon for the price of salted salmon in the Hakodoti market has within a year risen from 12 pounds for 1 yen to 3 pounds for 1 yen, one yen being about 50 cents.

USE OF FISH BY OUR ARMY ADVOCATED.

"National Army to Be Well Fed" was the caption in one of the evening newspapers on Thursday, and in reading the list of foods to be furnished our soldiers

Fig. 75. Fishing boats loaded with sardines, San Pedro, California, August, 1917. Photograph by W. P. Thompson.

while in camp one is tempted to believe that in the matter of serving the inner man their wants will be taken care of as well or even better than if they were in their own homes. Apparently only one thing is lacking from the schedule prepared for ten days—and that is fish. With the government continually advocating the greater use of fish in order to conserve the meat supply, it is only natural to suppose that the commissary department of the United States army would pay some attention to the question of fish, particularly when it is generally known that Great Britain has purchased 14,000,000 pounds to be supplied by the United States.—*The Fishing Gazette.*

"EAT MORE FISH."

Under the heading "Eat More Fish" the Bureau of Fisheries sends out the following poster:

Fish is meat and has a high food value.

Analysis shows that fish meat contains as much body-building food as beefsteak.

Experiments show that fish is as readily digested as other meats.

You could replace all other meats with fish every day in the year without ill effects. There are more possibilities of increase in the meat supply by the fisheries than by any other one industry. The demand in the past has not equaled the supply.

Eat fresh fish if you are near the source of fresh fish, but don't expect to buy at a low price fresh fish that have to be shipped by express for long distances on ice. Consume your locally-caught fishes and don't all use the same kinds. The cheapest is often as good as or better than the dear.

Eat salt fish wherever you are. Write the Bureau of Fisheries for recipes for preparing salt fish for the table. If you eat meat for breakfast make it salt herring, salt mackerel, or other salt fish. Salt fish are good eating if you prepare them properly for the table. Do that.

Eat smoked fish. There is nothing better than fish prepared by this old-fashioned method. Smoked herring, smoked eels, smoked bowfin, smoked shark, smoked carp. The three last mentioned are just being introduced to the market. Make them go. Write for recipes for preparing smoked fish for the table.

Don't let Friday be the only fish day. Eat more fish more days a week.

Don't stand back on disagreeable names or ungainly appearances.

Prejudice is an expensive luxury. A shark would not taste any better if called by another name; it tastes good, as it is. Carp is good eating and nutritious. You will not find any fish on the market that is not fit to eat if it is in good condition. The best test of a good fish is not its name, but its freshness.

Look out for new fish. They are coming. Bowfin, grayfish, barbat, goose-fish, shark, skate, sablefish, grouper.

Preserve fish in the home. Small-pressure canners are already in use by thousands of people. Put up a supply of fish when you can get them cheap. Can the roes, too; they are especially nutritious.

Eat fish—cultivate the taste—get the habit.

PRESERVING FISH WITHOUT ICE.

In the *Canadian Fisherman* for July, 1917, appears the following article on "Sherman's Method" of preserving fresh fish, which should be of interest to dealers in the present movement to increase the consumption of fish:

"PRESERVING FISH WITHOUT ICE OPPORTUNITY FOR THE SMALL PRODUCER.

"Sherman's Fish Sterilizing Company, Ltd., 1416 Standard Bank building, Vancouver, B. C., is the owner of the Henderson process for preserving fish without ice.

"A. H. Sherman, proprietor of the Defiance Packing Company, is the Britisher who introduced this process into Canada, being impressed with its importance from the fact that the Board of Agriculture and Fisheries, 43 Parliament street, London, England, reported in February, 1917, that 'there appears to be no ground for doubting Mr. Henderson's claim as to the practicability of the process on a commercial scale.' When a British government board puts its seal of approval on a fish preserving process it is good enough for all Britishers, is Mr. Sherman's opinion.

"Many tests with an experimental plant have been carried out in Vancouver, and their results have been satisfactory to all concerned. After a recent test, Mr. Sherman received the following unsolicited testimonial from Edward G. Taylor, inspector of Dominion fisheries, Nanaimo, B. C.:

"'The test proved entirely successful and the process was exceedingly simple, and no ice was used at any time during the process. I also ate salmon which had

gone through the process, and had been out of the water for fourteen days, and this salmon was just as fresh and firm as if it had been taken out of the water that very day. The bone of the salmon was strong, sound and sweet, proving conclusively that the process was entirely successful in preserving fish without ice for at least fourteen days, and from what I have seen, I have no doubt it would keep a very much longer time. I believe the process will be a great boon to the country and be an immense factor in the development of the fishing industry.'

"Some of the processed fish was expressed to W. A. Found, Department of Naval Service, Dominion Fisheries, Ottawa, and he wrote after sampling it: 'There was nothing in the taste of either fish that suggested to me that they had not been cured immediately following their being landed.'

"It is claimed by the owners of this patented process for preserving fish without ice that because no ice is needed the cost of preservation is lessened, and therefore, the fish can be sold cheaper.

"All the original flavor of the fish is maintained. The process applies to fresh and smoked fish, and also to meats, with which successful tests have already been made.

"The whole process from start to finish takes only three hours. Salt, low temperatures and sterilization are salient features of the process. First the fish is put into a cooling tank filled with water and brought to a low temperature. In half an hour the latent heat in the fish is extracted gradually and entirely. Then the fish is put into a second tank of sea water or fresh water strengthened by the addition of salt. In order to prevent freezing the water is agitated by a pump which draws it off through one pipe and drives it back again through another, passing through a filtering chamber charged with willow charcoal to kill the germs. The extremely low temperature of the salt solution seals up the pores of the fish and prevents saturation, acting as an antiseptic protection on the outside. After three hours the fish is taken out and presents a fresh appearance. It is impervious to decay for ten days, and may be kept in a cool room for months.

"Robert Mann, superintendent of the Henderson Process Plant at Dock street, Fleetwood, England, who installed the first plant at Lisbon, Portugal, writing under date of February 28, 1917, of the process of the Fleetwood plant says:

"'I can not speak too highly of the great success of this plant. Treated fish kept in excellent condition for a fortnight or longer in changing weather, the flavor being equal to that of newly caught fish; it never becomes flabby as in the

Fig 76. Part of a day's catch of sardines at Monterey, California.

case of fish that has been on ice. It is also admirably adapted for use in connection with smoked fish being first treated and then smoked. It keeps for a much longer time, especially in hot weather, and has a better flavor.'

"Mr. Sherman sees great possibilities in this process, for it is cheap to install and it will give the small producer of fish a means of preserving his catch so that he may reach the distant markets with his fish in good condition. He considers this process will not antagonize the cold storage companies, but will supplement the work they are doing in increasing the production of fish."

MISCELLANEOUS BRINE-SALTING.

All along the Atlantic coast of the United States a small local business is carried on in pickling fish for use during the winter in the homes of fishermen and their neighbors. Among the species thus prepared are bluefish, squetongue or sea trout, channel bass, croakers, perch, sheepshead, Spanish mackerel, striped bass, black bass, hogfish, etc. There is no uniform method of pickling, the fish being dressed, salted and packed according to the fancies and convenience of the curers, and the product rarely goes on the general market. In general, the fish are dressed by removing the head and viscera, and are split down the back or sometimes the belly, so as to lie out flat. They are next washed and soaked until the blood is removed and then covered with salt and placed in barrels, first a sprinkling of salt and then a layer of fish, and so on until the barrel is filled. Then brine is poured in to fill the interstices and the barrel is headed and coopered.—From "The Preservation of Fishery Products for Food," by C. H. Stevenson, in *The Bulletin of the U. S. Fish Commission*, for 1898, pp. 464–465.

UNITED STATES FOREST SERVICE COOPERATION.

MOUNTAIN LIONS KILL DEER.

During 1916, four deer were reported as being found in the Sierra National Forest which had been killed by mountain lions.

One cowman, while riding after cattle, saw a lion carrying a spotted fawn, so gave chase for about a mile. At one time he got as close as twenty feet from the lion, but still he stayed with the fawn, even though its feet were dragging on the ground, and the lion would occasionally step on them as he ran.

Last October this same cowman killed a black bear that weighed about 000 pounds, from which he fried out 40 pounds of lard.—C. E. JORDAN.

CLEVELAND GAME REFUGE.

The Cleveland game refuge has shown the advantage of a protected area. The number of deer killed along the edge of the refuge was double the amount killed for the past several years.

The long open season on doves and quail is proving disastrous to the birds, especially the doves. The early shooting in September finds about 15 per cent of the doves still nesting. The largest part of the birds killed are half grown and full of pin feathers. What old birds that are killed are usually poor and many show signs of still nesting. In the early part of September I have found as high as ten doves still on the nest.

The logical thing to do is to combine the dove and quail season and not have over two months to hunt.

It is often claimed that the doves leave the open country early. They do, but they come back in November and December. The birds are then fat and full-grown.—J. B. STEPHENSON.

MOUNTAIN SHEEP AT HEAD OF KERN RIVER.

A band of mountain sheep range on the Kaweah Peaks, to the north and east of the Big Arroyo, in the Sequoia National Forest. Stockmen who have been grazing their cattle in that vicinity for several years, believe there is a decided increase in the band, judging by the number of tracks observed.

These sheep are very wild. They stay in the rough country and are seldom seen. Thomas Smith, a stockman, reports seeing one late in the fall near Kennedy Meadows, on the south fork of Kern River, and it is believed that some of the band that spends the summer in the high peaks near the head of Kern River winter on the south slope of Olancha Peak and the Kennedy Meadows country.—F. P. CUNNINGHAM.

REPORTS.

NUMBER OF DEER KILLED IN VARIOUS COUNTIES DURING THE OPEN SEASONS, 1914-1916.

District No. 1.

County	1914	1915	1916
Alpine	39	66	170
Amador	36	43	64
Butte	39	26	170
Calaveras	202	111	179
Del Norte	*	225	250
El Dorado	300	109	82
Fresno	151	156	115
Humboldt	200	167	300
Inyo	46	181	54
Kern	235	121	375
Kings	14	1	31
Lassen	89	126	87
Madera	57	34	104
Mariposa	53	10	38
Merced	†	*	*
Modoc	160	106	106
Mono	132	4	6
Nevada	143	65	75
Plumas	77	87	50
Plumas	200	90	276
Sacramento	30	*	*
San Joaquin	8	*	*
Shasta	357	492	425
Sierra	37	11	45
Siskiyou	575	665	578
Stanislaus	†	81	25
Sutter	*	*	*
Tehama	198	164	258
Tulalty	735	543	708
Tulare	148	223	285
Tuolumne	309	174	311
Yuba	6	14	*
Totals	4,464	4,028	4,539

District No. 2.

Colusa	230	262	233
Glenn	89	215	170
Lake	161	84	198
Marin	170	325	194
Mendocino	308	300	370
Solano	11	5	*
Sonoma	426	200	131
Yolo	28	127	61
Napa	373	119	167
Totals	1,950	1,997	1,495

District No. 3.

County	1914	1915	1916
Alameda	8	‡125	‡125
Contra Costa	*	†	175
Monterey	632	595	91
San Benito	11	55	50
San Francisco	No	hunting	*
San Luis Obispo	60	155	167
San Mateo	5	55	150
Santa Clara	5	362	401
Santa Cruz	155	‡132	124
Totals	876	1,479	1,283

District No. 4.

Imperial	*	*	5
Los Angeles	143	95	153
Orange	21	*	20
Riverside	102	55	45
San Diego	45	44	35
San Bernardino	97	29	60
Santa Barbara	475	338	270
Ventura	*	172	213
Totals	886	733	801

Reports Unspecified as to Counties.

Shasta National Forest	87	----------	
Lassen National Forest	13	----------	
California National Forest	238	----------	
Stanislaus National Forest	96	----------	
Santa Barbara National Forest	89	----------	
Sierra National Forest	----------	106	
Totals	523	106	
Total for year 1914	8,699		
Total for year 1915	----------	8,343	
Total for year 1916	----------	----------	8,11[illegible]

*No record.
†Closed season.
‡Estimated.

CALIFORNIA FISHERY PRODUCTS FOR APRIL, MAY AND JUNE, 1917.

Species of fish	Humboldt	Mendocino, Lake	Marin	Solano, Yolo	Sacramento, San Joaquin	Alameda, Contra Costa	Monterey, San Luis Obispo, Santa Barbara, Ventura	Santa Cruz	Monterey	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego	Mexico	Total
Albacore											2,038,608		503,640		2,542,248
Anchovy			6,475				18,595		25,880		16,997				67,947
Barracuda									265	4,500	1,161,776	8,000	179,214	14,000	1,367,755
Bonito											3,092		325		3,417
Boracchi							29,658		20,751						50,409
Bluefish							17,249								17,249
Chilipepper							113,857		2,740						116,597
Carp				12,008	16,272	20,154	13,856								62,290
Catfish		30,452		9,264	32,248	29,457									101,421
Cabezon						8,270	221,170	19,500	48						248,988
Cultus cod	90	2,566					77,486	29,058	21,243	800					130,237
Dogfish						2,926	17,280				5,385		494		86,287
Flounder	1,127		67	377	1,374	102,613	474,397	11,510	54		150	515			492,564
Halibut	4,222	11,615	161				14,630	3,756	3,949	54,485	398,575	14,020	161,891	480,920	1,294,548
Hake							16,440	15,999			947		11		33,438
Herring			349,619						8,499		1,010				359,129
Kingfish							18,532	14,415	29,577	2,600	193,690	800	7,105		288,149
Mackerel									1,327	1,200	304,816	2,200	692,252		911,895
Mullet							2,540						432		2,972
Pike				786	1,801	404									2,991
Pompano							1,276	5,520	1,084		11,757		835		25,476
Perch	12,287		6,859			171	3,895	14,415	3,276						42,203
Surf fish											54,141	1,585	114,289		170,412
Rockfish	3,972	1,586	764				122,736	12,211	158,146	5,000	695,971	7,168	274,787	80	1,282,076
Sole						49	923,927	423,645	5,395	1,000	8,567				1,362,583
Salmon	149	46,242		146,287	273,625	474,287	93,247	226,139	2,967,460						3,984,324
Smelt	5,462		4,998			1,040	50,997	11,502	7,045	25,476	16,792		7,105		388,674
Sea bass (white)							81		122	2,000	256,456	5,100	26,787		290,546
Sea bass (black)							61			250	1,890	1,500	52,457	34,780	91,178
Sturgeon			25				502,670	228,028	1,882	1,000	4,120	867			738,592
Striped bass			1,305	117,031	62,466	128,155	148,000		120						445,077
Shad				1,195,394	442,491	3,277,942	26,704								5,242,531
Sturgeon				597	1,346	4,446	48								6,437
Sardine							268		3,589,680		20,262,176		626,804		24,479,028

CALIFORNIA FISHERY PRODUCTS FOR APRIL, MAY AND JUNE, 1917—Continued.

Species of fish	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Solano, Yolo	Sacramento, San Joaquin	Alameda, Contra Costa	San Francisco, San Mateo	Santa Cruz	Monterey	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego	Mexico	Total
Skate							[illegible]	190			2,060				[illegible]
Sculpin							[illegible]				5,780				[illegible]
Sea trout											760	360	468		[illegible]
Tom cod							5,400				8,770				[illegible]
Turbot			80												[illegible]
White bait		345	1,451				[illegible]	65							[illegible]
Yellowtail									6,671	386	249,670		5,441		[illegible]
Stingray			17,420												[illegible]
Miscellaneous	1,422	7,744		1,720	1,815		5,000	5,751	40		20,717		9,084	6,401	[illegible]
Total fish	23,679	95,168	126,171	1,476,404	1,156,272	4,041,093	[illegible]	1,084,670	6,905,494	144,859	37,756,486	46,774	2,219,447	130,468	[illegible]
Crustaceans—															
Crab (dozen)	2,664	995					19,778	2,967	954				57		[illegible]
Spiny lobster											2,481		4,799	105,000	[illegible]
Shrimp							125,714								[illegible]
Devilfish		20													
Totals															[illegible]
Mollusks															
Squid									225,724		45,294		400		[illegible]
Cuttlefish			47				1,076	3,000	2,000						[illegible]
Clam (Pismo)								1805		77,500					[illegible]
Clam (rock)			12,492							500	13,246				[illegible]
Clam (soft-shell)	11,750	3,500	170,300			30,500									[illegible]
Clam (unspecified)			2,100				45			1,449		1,500			[illegible]
Oyster (shell)			9,000				1,070,000								[illegible]
Abalones		4,750							[illegible]	[illegible]					[illegible]
Mussels	1,000	1,000							6,000	4,000	15,000				[illegible]
Cal. oysters			10,000												[illegible]
Bay mussels			500			7,500	147								[illegible]
Totals															[illegible]

*Crab are estimated at 3½ pounds to dozen.

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CALIFORNIA FISH AND GAME

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THE SKATES AND RAYS OF CALIFORNIA, WITH AN ACCOUNT OF THE RAT FISH.*

By Edwin Chapin Starks.

This account of the skates and rays of California may be considered a continuation of the account of the sharks that appeared in the last number of this journal, for the skates and rays are closely related to the sharks, and may be regarded as an offshoot developed from them. The appearance of the skates on the earth was much later than that

of the sharks, fossils of which are known back almost to the first of the animals with a backbone.

Though the typical sharks and the typical skates do not look at all alike, we have sharks that do look very much like the skates, such as the angel-shark; and skates, on the other hand, that are rather shark-like. The character that may be most readily used to separate them is the position of the gill slits. In the sharks the gill slits are on the side of the body; sometimes extending down on the lower surface, but the upper end is always on the side. The skates and rays have the gill slits altogether on the lower surface of the body. There are several other characters that separate the sharks from the skates and rays, but they are internal and need not be considered here.

The skates and rays are specialized for life on the sea bottom. They are not swift swimming fishes like the sharks that feed on other fishes, but they depend on crabs and clams and such forms of animal life for their food. The body by the development of the pectoral fins, which extend forward along the side of the head, is flattened and disk-like. The caudal fin may, or may not, be present. When it is not the tail is more or less whip-like. None of them have an anal fin, and in many the dorsals are also absent. When present the dorsals are far back on the

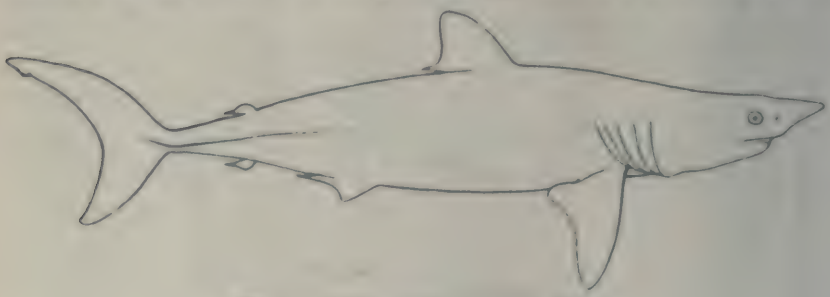

Fig. 1. Bonito shark. *Isuropsis glauca.*

body or tail. The teeth may be in the form of a pavement, sometimes being perfectly flat for crushing, or they may be with fine points. The spiracle, which in the sharks is a small pore behind the eye, or else is entirely absent, is in the skates and rays a large opening through which water is introduced to the gills for breathing purposes. This avoids the introduction of sand or sediment into the gill chamber as would probably happen did they take water through the mouth (as the sharks do) when they lie flat on the sea bottom.

The skates like the sharks have claspers in the male. These in the young extend scarcely past the ventral fins, but in the adult they develop to a large size (see figs. 5, young, and 10 and 11, adult).

I have changed the form of this paper from that on the sharks by giving first a description of the different families of the skates and rays. This saves repeating all of the characters under each species. Hence in identifying any fish of this group it will be necessary to first find its family.

FAMILIES OF CALIFORNIA SKATES AND RAYS.

Caudal fin developed. Tail thick and with two dorsal fins on top of it. Ventral fins not notched on outer edge‡ (see fig. 6 for notched ventrals). Skin rough with scattered spines. Color not uniformly black.

1. The Guitar Fishes (family Rhinobatidæ). Page 4.

Caudal fin developed. Tail thick and with two dorsal fins on top of it. Ventral fins not notched on outer edge‡ (see fig. 6 for notched ventrals). Skin everywhere perfectly smooth. Color uniformly black.

2. The Electric Rays (family Narcobatidæ). Page 6.

Caudal fin absent, or represented only by a slight fold of skin. Two dorsal fins crowded together near tip of tail. Ventral fins notched on outer edge (as in fig. 6). Skin rough with scattered spines.

3. The Skates (family Rajidæ). Page 7.

Tail slender, often whip-like. No dorsal fin. Caudal fin present or absent. Back of tail with a long spine or sting (sometimes duplicated, occasionally absent.) Eyes not at edge of head.

4. The Sting Rays (family Dasyatidæ). Page 11.

Tail whip-like, without caudal fin. A single dorsal fin just in front of sting. Sting often duplicated. Eyes at edge of head. Teeth large and flat, forming a tile-like pavement.

5. The Eagle Rays (family Ætobatidæ). Page 13.

Tail whip-like, without caudal fin. A single dorsal fin opposite ventral fins. Sting behind dorsal or absent. Eyes at edge of head. Teeth small and numerous. Head with a pair of horn-like arms just under the front of it. Size enormous.

6. The Sea-Devils (family Mantidæ). Page 13.

GLOSSARY.

The names of the fins may be learned from fig. 2.

Claspers. Rod-like organs, one attached to the inner edge of each ventral fin in the male. Not projecting beyond the fin in the young.

Disk. The flattened part of the body made by the projecting pectoral and ventral fins.

Rostral ridges. The ridges running forward from in front of the eyes to the tip of the snout.

Shagreen. The skin when it feels like fine sandpaper.

Snout. The part lying directly in front of the eyes.

Spiracle. The hole just behind the eye.

‡Do not mistake the notch formed by the crowding of a number of the rays for a notched fin.

1. THE GUITAR FISHES

(Family Rhinobatidæ).

The Guitar Fish (Rhinobatus productus).

This is often called shovelnosed shark, especially on the southern coast. This name should be discouraged, as it is not a shark, and as we already have a shark (*Heptanchus*) known by this name.

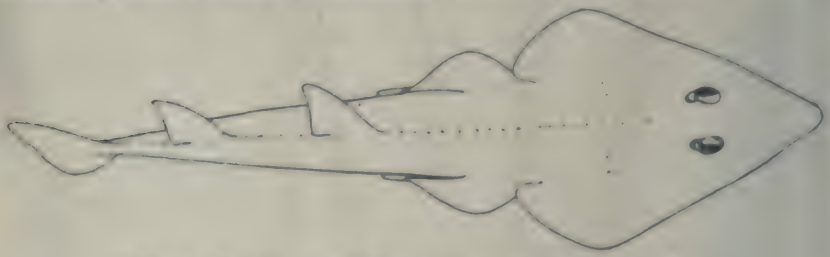

Fig. 1. The guitar fish *Rhinobatus productus*. Adult male.

The guitar fish is not much expanded and disk-like, being sharply wedge-shaped in front and tapering into a thick tail behind. Two dorsal fins and a caudal fin are well developed. The body is covered with shagreen and there are rows of hooked spines along the middle line of the back and tail, and a small bunch at the shoulder. The young fish has small spines around the inner border of the eye and along the rostral ridges. The color is uniform dull brownish on the upper surface and white on the lower.

This fish is found from San Francisco to San Diego and southward. South of Point Concepcion it is very common. It reaches a length of 3 or 4 feet.

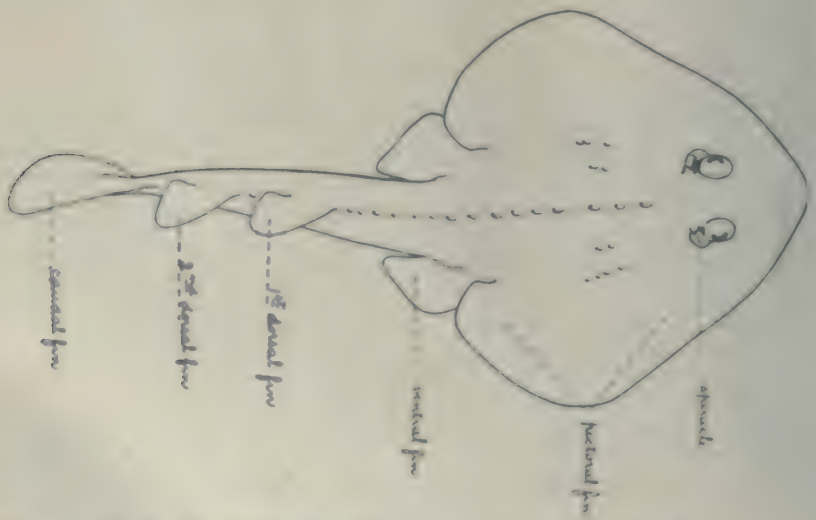

Fig. 2. The guitar fish *Zapteryx exasperatus*. Young female.

The Prickly Skate (Zapteryx exasperatus).

The front margins of the disk are undulating and together form an angle less than a right angle. The snout is prominent but blunt at the tip. The front of the first dorsal fin is only a little behind the hind edge of the ventral fins. The upper surface of the body is covered with close-set prickles of different sizes, rather than shagreen as in the next species. There is a row of enlarged spines along the middle of the back and the tail, and 2 short rows on each shoulder of 2 or 3 spines each. There are no spines on the sides of the tail. The color is grayish brown with indications of clouded crossbars. There is a large black blotch on the lower surface of the pectoral at its hind end.

This species has been recorded only from southern California, being scarcely known outside of the bay of San Diego. Nearly 38 years ago, when this fish was first described, males were reported to be abundant in San Diego Bay. No female has ever been recorded until now. Recently I was loaned two young specimens by Dr. Ritter of the Scripps Laboratory at La Jolla, one of which was a female. Aside from the absence of claspers, it is identical in all of its characters with the male. It is 7½ inches long and is the specimen here figured. This species reaches a length of nearly 3 feet, and appears to be very rare.

The Round Skate (Platyrhinoidis triseriatus).

This species may be known from the other members of its family by the disk being rounded in front; the curve being unbroken by the snout. The front of the first dorsal fin is nearer to the beginning of the caudal fin than it is to the point where the ventral fin joins the body. Both surfaces of the body are covered with shagreen. Coarse prickles follow

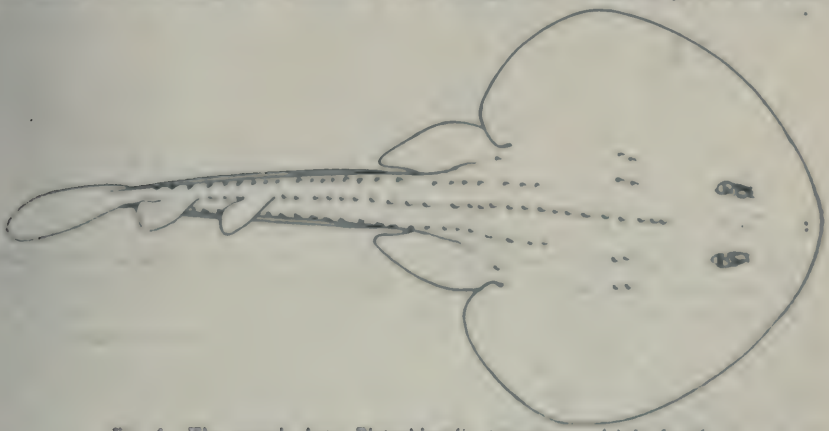

Fig. 4. The round skate *Platyrhinoidis triseriatus*. Adult female.

the front margin of the pectorals. There is a small bunch of spines at the tip of the snout, and a few around the inner margin of the eye. A long series of spines follows the middle line of the back and tail, and a row at each side of it on the tail. There are 2 small bunches of spines on each shoulder of 1 or 2 spines each. It is grayish brown in color.

This species reaches a length of 2 feet, and is found in some abundance in the bays on the coast below Point Concepcion. It has been taken once or twice as far north as San Francisco.

2. THE ELECTRIC RAYS

(Family Narcobatidæ).

The Electric Ray (Tetronarce californica).

This is the only member of its family on our coast, and may be recognized by its broad circular disk, covered with smooth black skin without spines or prickles anywhere, and by its well-developed caudal fin and two dorsal fins. The eyes are very small, and the small mouth is provided with fine sharp teeth. It is blue-black, or dark lead color, above and white on the lower parts.

The electric ray is said to reach a length of 3 feet, though it is seldom seen much over a foot in length. It is known from central California southward to the Santa Barbara Channel, being rather common in deep water in Monterey Bay.

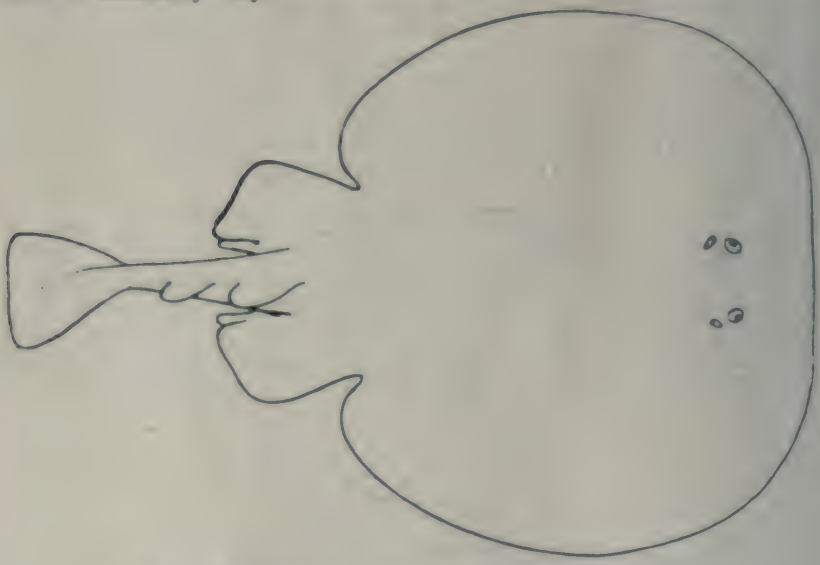

Fig. 5. The electric ray *Tetronarce californica*. Young male.

This ray is provided with an electric organ composed of hexagonal cells, reaching from the skin of the upper surface to that of the lower, and situated at each side of the head and gill chambers. The electricity discharged from this ray has the properties of other electricity, such as rendering an iron bar magnetic, decomposing chemicals, and producing a spark. Stories vary as to the volume of the discharge, but even a small ray is capable of inflicting considerable pain. After a few discharges the fish becomes exhausted and must rest before its electric organs are again functional. It is of interest to note that the first record we have of the application of electricity is of the time of Anthony and Cleopatra, whose court physician recommended the electricity of an electric ray for medical purposes, especially for pains in the head. Later it was prescribed for the cure of gout.

3. THE SKATES

(Family Rajaida).

The Long-nosed Skate (Raja rhina).

This skate may be known by the long projecting snout, making the front outline of the disk deeply concave. (Compare the straight line drawn from the tip of the snout to the outer pectoral angle, in its relation to the outline of the front of the disk, in the figure of this species with that of the next.) When the front edge of the ventral fin is held at a right angle with the tail its outer edge is concave as in fig. 7. The rostral ridges are grown together along their front half. Very small spines are scattered over the outer edges of the body and back behind the shoulders, but leaving large areas of smooth skin. Coarser

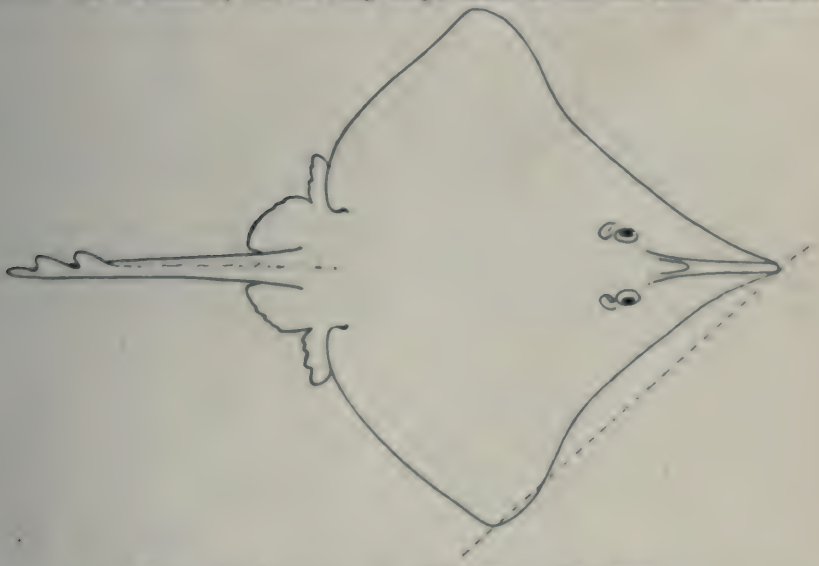

Fig. 6. The long-nosed skate *Raja rhina*. Adult female.

ones at front edge of body, snout, and between eyes. Enlarged spines around inner edge of eyes, along middle of back (usually absent in large specimens) and on back of tail. The male has a row of long, sharp spines near the outer angle of the body. The color is dark sienna-brown with irregular dark blotches sometimes present. There is a spot at the base of the pectoral in the form of an irregular ring, always present in the young and sometimes in the adult, but usually present as an indistinct spot. This is never wider than the space between the eyes.

This skate is found from the Gulf of California to Alaska, and on the California coast is common nearly everywhere. It reaches a length of 3½ feet. The egg cases of this skate are 3 or 4 inches long, and usually contain only a single egg.

The Common California Skate (Raja inornata).

The snout in this skate is not so projecting as in the long nosed skate. The region at each side of the snout is concave, as is the region toward the outer angle of the pectoral, while the region midway between these

points is convex. When a straight line is drawn from the snout to the outer angle of the pectoral the middle of the line nearly, or quite, touches the body. Ventral fins as described for the long-nosed skate

Fig. 7. Ventral fins of *Raja inornata*, showing the front edge of the ventral fin held at a right angle with the tail making the outer edge concave. Fig. 9 shows the fin notched as in normal position.

Fig. 8. Ventral fins of *Raja binoculata*, showing the front edge of the ventral fin held at a right angle with the tail, making the outer edge nearly straight. Fig. 10 shows fin concave as in normal position.

(see fig 7). The rostral ridges are grown together along their front half. Small prickles are scattered over the outer edges of the pectorals and along the middle line of the back. Larger ones are on the snout and between the eyes. Enlarged spines are around the inner edge of

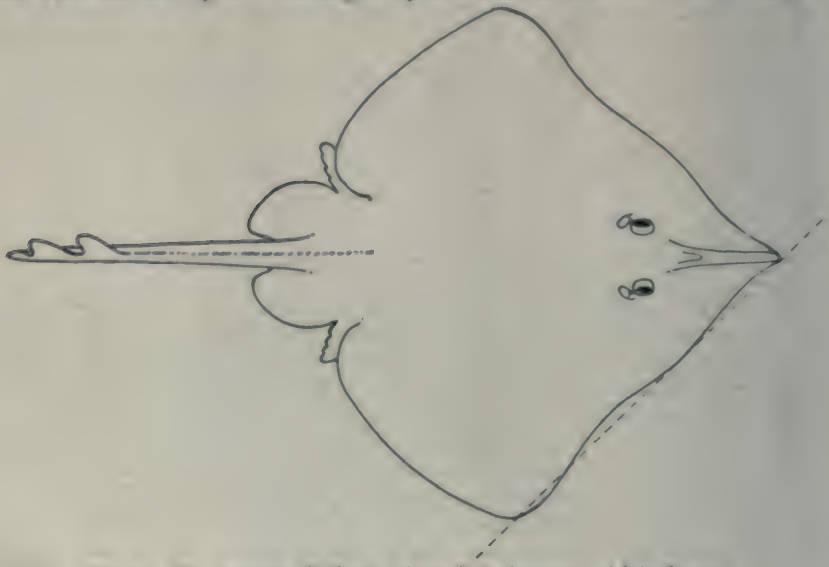

Fig. 9. The common California skate *Raja inornata*. Adult female

the eye, and from 3 to 5 rows of them on the back of the tail. The color is dark brown, with usually a small ring composed of irregular spots at the base of the pectoral.

This skate is known from San Diego to San Francisco and somewhat northward, but has never been recorded beyond the California coast. It reaches a length of 2½ feet.

The Big Skate (Raja binoculata).

This skate may be known from any others of its family by the shallow notch in the ventral fins. When the front edge of the ventral fin is held at a right angle with the tail, its outer edge is nearly straight, as in fig. 8. The rostral ridges are grown together along their front fourth only. The upper part of the body is everywhere covered with very small prickles, uniform in size, and as fine or finer than those that compose shagreen, but not nearly so closely placed. These are absent in the young. There are from 1 to 3 rows of irregular spines along the back of the tail. The color is dull olive brown, or drab, with a large dusky spot at the pectoral base blended into the body color. Light

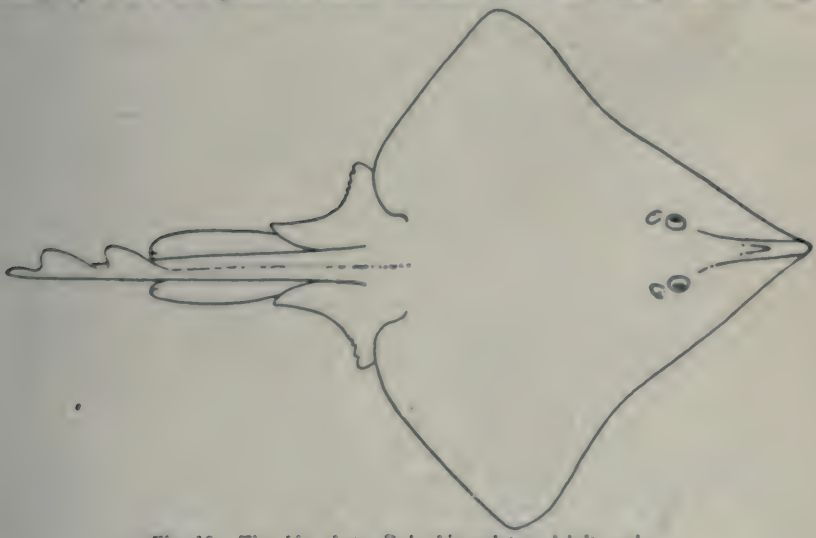

Fig. 10. The big skate *Raja binoculata*. Adult male.

spots as large as the eye are scattered over the body and form a ring around the pectoral spot. The diameter of the ring is always much greater than the space between the eyes.

This skate is common from Monterey Bay northward to Alaska. It reaches a length of over 6 feet. Its egg cases are nearly a foot in length, and each contains from one to six eggs or young.

The Starry Skate (Raja stellulata).

This skate may be known from others of its family by the almost entire absence of the rostral ridges, the rostral cartilages being very slender rods that can scarcely be detected. It also differs from all but the rock skate in having the body at each side of the snout convex instead of concave, and in having a straight line drawn from the tip of the snout to the outer pectoral angle, everywhere passing inside of the outline of the body. Small sharp prickles are scattered everywhere over the upper surface of the body, and a series of enlarged spines runs down the middle of the back and tail. The color is grayish brown with small dark spots scattered over the back. A large, irregular, yellow spot ringed with brown is sometimes just behind the middle of the body

on base of each pectoral; a smaller, round one, just inward from it, and a third one just outward from the eye. These spots are often absent.

This skate is found in rather deep water from southern California northward to Alaska. It reaches a length of 2½ feet.

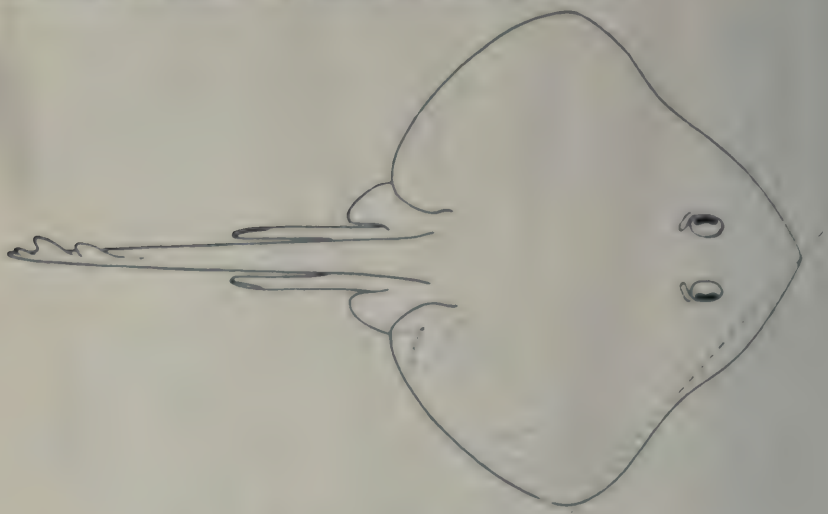

Fig. 11. The starry skate *Raja stellulata*. Adult male.

The Rock Skate (Raja montereyensis).

This skate resembles the starry skate in having the region at each side of the snout convex in outline, and in having a straight line (if drawn) from the snout to the outer pectoral angle included within the outline of the body. In all of the others such a line would pass outside of the outline. It may be known from the starry skate by the rostral ridges,

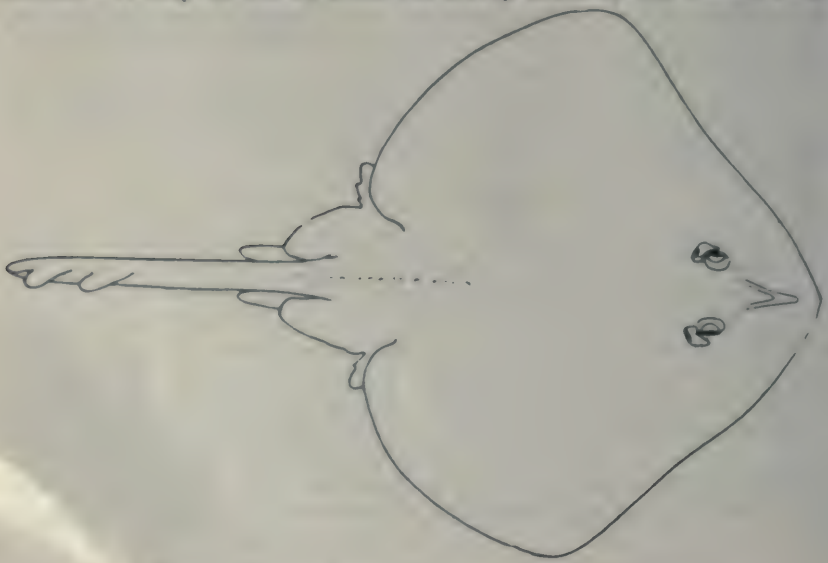

Fig. 12. The rock skate *Raja montereyensis*. Adult male.

which are strong and well developed as in the other skates. The rostral ridges meet close to their tips. The upper surface is everywhere covered with prickles, which are coarsest and most numerous on the middle of the back and between the eyes. A band of larger spines follows the front outline of the body. Two or three enlarged spines are around the inner edge of the eye, or they may be absent in large specimens. A row of enlarged spines follows down the middle line of the back and tail, and may be present on each side of the tail. The region in front of the mouth is rough on the under side of the body. The color is slaty brown with some darker mottlings. Small dark spots make irregular bars across the space between the eyes. A dark spot surrounded by a broken ring of small spots occupies the base of the pectorals. A short distance behind this is a small white spot.

Little is known as to the distribution of this skate, as it has only recently been recognized by science, though it seems to be known to fishermen, who pronounce it the best table fish of all of the skates. It does not reach a large size. The only specimens known have been taken in deep water off Santa Cruz.

4. THE STING RAYS*

(Family Dasyatida).

The Round Sting Ray (Urolophus halleri).

This is sometimes called the little sting ray. It may be known from other members of its family by the tail being shorter than the rest of

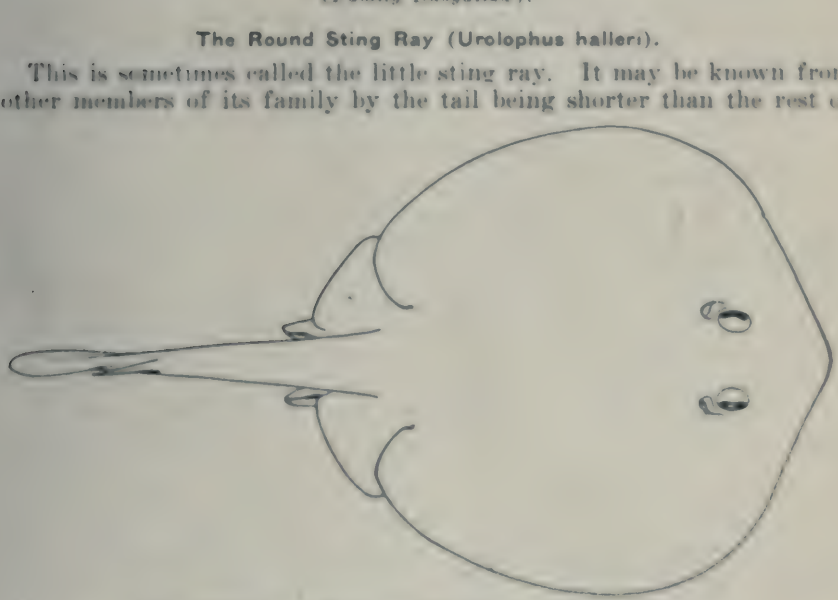

Fig. 13. The round sting ray *Urolophus halleri*. Adult male.

the body, and the width of the body being less than the entire length. The outline of the disk is circular, and the skin is smooth or without spines. A narrow, long caudal fin is present, but no dorsal fin. The color is dark brown or slaty brown above, and is usually with lighter

*Should a person be so unfortunate as to be stung by one of these rays, he will appreciate the advice to hold the wounded part in hot water. This will usually take the pain away immediately for as long as the treatment is continued, and the patient will be very ready to continue it, even for several hours, to escape the almost unbearable pain. The wound should, of course, be disinfected.

spots, but not always. The spots may be clear cut and separated, or blended and more or less run together.

This is the smallest of our sting rays, but its numbers and activity make it one of the most dreaded by bathers. It scarcely exceeds a foot in length, and is found on the coast south of Point Concepcion and southward to Panama. In sheltered bays on shallow sand or mud flats it occurs in almost countless numbers.

The Rat-Tailed Sting Ray (Dasyatis dipterura).

This is known from other sting rays of California by its long whip-like tail, longer than the rest of the body, and in addition the eyes are on top of the head, not near the edge of the disk. There is no dorsal or caudal fin, but the tail is provided with a long vertical fold of skin above and below. The outline of the disk is somewhat circular, though the front edges are nearly straight and meet at a slight angle at the snout. The skin is very slightly rough to the touch, and large specimens have a row of enlarged spines along the middle of the back, and a couple of spines at the shoulder. The color is plain bluish brown without spots.

This ray is found in southern California and is rather abundant in San Diego Bay. It reaches a length of 6 feet.

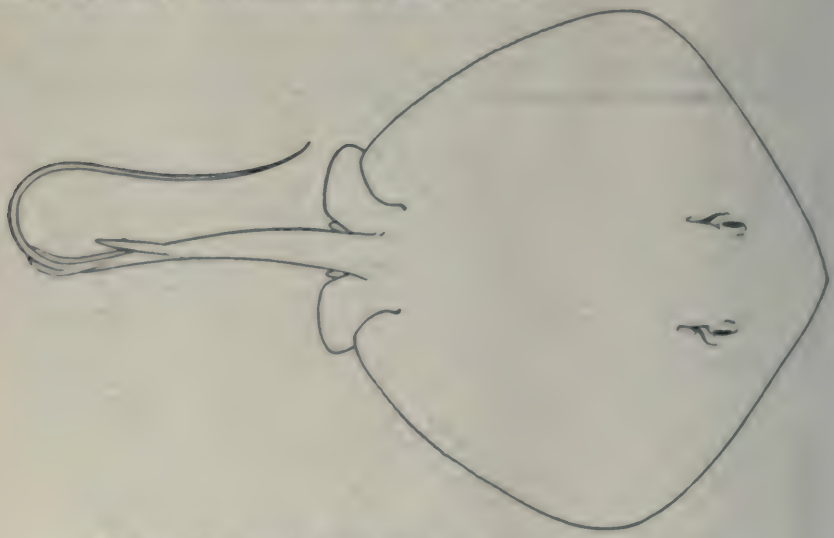

Fig. 14. The rat-tailed sting ray *Dasyatis dipterura*. Young male.

The Butterfly Sting Ray (Pteroplatea marmorata).

This may be known from all other skates and rays by the great width of the disk and the very short tail. It is very much wider than the entire length of the body and tail. The tail is flattened and has a slight fold of skin above and below, but no dorsal or caudal fin is developed. The skin is perfectly smooth and no spines or prickles are developed anywhere. The sting is very small or frequently absent. It is dark brown in color and mottled with small light drab spots and short irregular lines formed by spots running together.

Fig. 15. The butterfly sting ray *Pteroplatea marmorata*. Adult male.

This ray is common south of Point Concepcion, frequenting the shallow tide flats of sheltered bays. It reaches a width of 4½ feet. Its sting is short and the small movement it is able to give its tail makes it one of the least dangerous of the sting rays.

5. THE EAGLE RAYS

(Family Etobatidæ).

The Bat Fish or Eagle Ray, Sometimes Called California Sting Ray (Myliobatis californicus).

This is the only representative of its family on our coast. The head stands above the disk at each side, and the eyes are on the side of the head close to the edge of the disk. The pectorals fins are sharp at the outer angles, and a single dorsal fin is present just in front of the sting. The tail is long, slender, and whip-like. The skin is perfectly smooth without spines or prickles. The teeth are flat and pavement like, resembling a tile floor. It is a uniform dark slate color above and white below.

This sting ray reaches a length of 3 feet and is common south of San Francisco. It is very destructive to oysters, crushing them between its wide flat teeth. Its depredations in this way have caused the owners of oyster beds in California to protect their property by fences of closely set poles driven into the mud around the beds.

6. THE SEA DEVILS

(Family Mantidæ).

The Sea Devil (Manta birostris).

This is a gigantic ray that may be known at once by a pair of projecting arms from under the front part of the head. The body is shaped much as in the bat fish (*Myliobatus*) with a long whip-like tail and a single dorsal fin. The teeth are small and in many series.

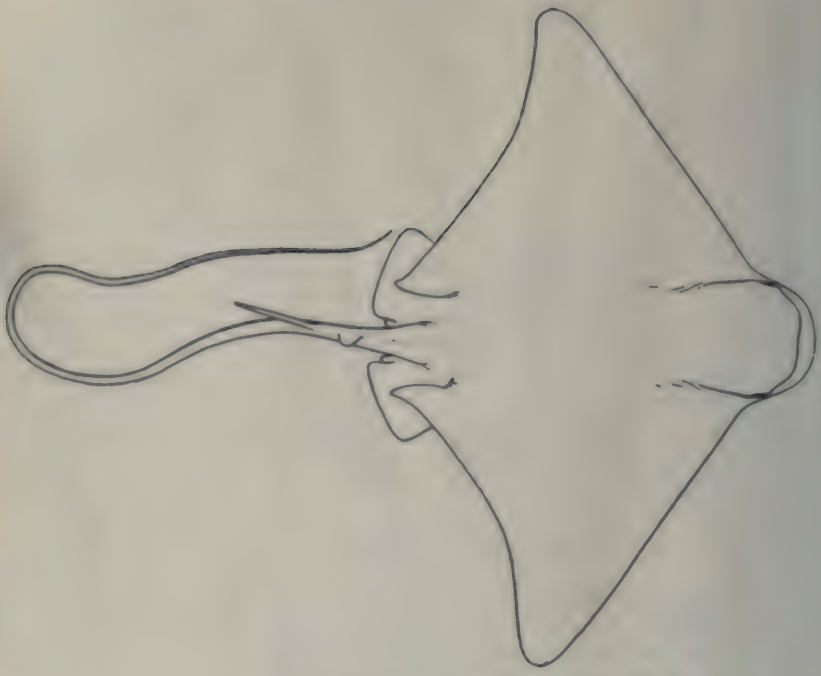

Fig. 16. The eagle ray *Myliobatis californicus*. Young male.

Fig. 17. The sea devil *Manta birostris*. Adult female.

This giant ray has been seen in our region only by fishermen, who have reported an immense ray off the coast of San Diego. It is known from tropical American waters, and is not uncommon on West Indian and Florida coasts. It reaches a length of 20 feet.

THE CHIMÆRAS.

The group that includes the sharks and skates is usually subdivided into two groups. The sharks and skates form one group and the chimæras the other. Little as the chimæras resemble the sharks their relationship is distinctly with them as is shown by their anatomy and development. We have on our California coast one representative of this group.

The Chimæra or Rat Fish

(Chimæra colliei).

The gills have only one external opening as in the majority of fishes. The skeleton is of cartilage. The skin is thin, smooth, and scaleless. The body is robust in the forward part, but tapers behind into a long tail ending in a fine point. The mouth is small under a blunt projecting snout, and is armed by thin plates formed by the united teeth. The first dorsal fin is triangular and has a long, sharp spine at its front edge,

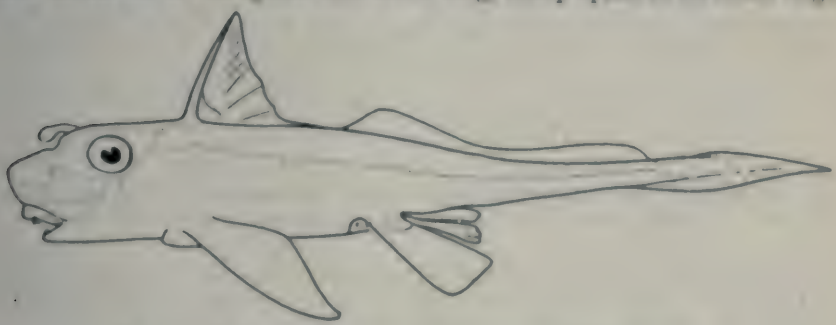

Fig. 18. The chimæra or rat fish Chimæra colliei. Adult male.

while the second dorsal is long and low with a wide rounded notch at its middle that nearly divides it into two parts. The caudal fin is narrow, with the tail projecting from it in a point. The anal is absent and the pectorals are long and wing-shaped. A series of channels and pores forms a crooked line along the side and branches over the head. The male has several appendages that are absent in the female. One is club-shaped, curving downward on the forehead, and is armed with sharp spines; one protrudes from a sheath of skin in front of each ventral fin; and behind each ventral is a pair of claspers. The color, when the fish is alive, is silvery but reflecting golden metallic hues, and pale green, rose color and blue. The pupil is a beautiful pale greenish blue. Out of the water its brilliant colors soon fade.

This peculiar fish is common along our entire coast, but as we go southward it is found in deeper and deeper water. In Puget Sound and northward it is taken in very shallow water. In Monterey Bay, though it is sometimes taken in shallow water, it is commonest in fifty or more fathoms. Below Point Concepcion it is never found in shallow water. It reaches a length of nearly 2½ feet.

THE QUINNAT SALMON IN NEW ZEALAND.

By N. B. Scofield.

During the last twenty or more years, efforts have been made to introduce the quinnat salmon of California into the waters of New Zealand. The method of introduction has been to take the salmon eggs from the hatcheries in this state, at a time when they have developed to such an extent that the eyes are plainly seen through the shell of the egg, but still a month at least before the time they will hatch. They are packed in specially-constructed crates in which they are kept at a low temperature to retard development. In this way they may be shipped to even more distant points than New Zealand. Upon arrival at their destination the eggs are kept in water at one of the fish hatcheries until they hatch out, and when the young fish are able to care for themselves they are liberated in the stream.

The following interesting account showing the success of the experiments is taken from the report of L. F. Ayson, Chief Inspector of Fisheries, New Zealand, for the year 1916-17:

"The number of [quinnat] salmon eggs collected last spawning season was 1,106,000; 866,000 were collected at the Hakataramea Station and 240,000 from the Dobson River. An effort was made to net the Ahuriri River for spawning salmon, but on account of the heavy current and freshets the attempt was not successful. The salmon eggs were disposed of as follows: 25,000 were supplied to the Tasmanian Government, 1,000,000 were sent to the West Coast to stock the Hokitika River, and 81,000 were hatched out at Hakataramea.

"I estimate that quite four times as many salmon came up the Waitaki last spawning season as during the season of 1915; the collection of eggs was more than four times the quantity taken the previous year.

"With regard to the time that these salmon commence to run in from the sea, the first fish this season was taken during the last week of January. A very large run came in during the last two weeks of February, and all through the month of March. In the Waitaki they were taken freely by trout-anglers; the number landed in this way is estimated at about 400 fish, averaging about 16 pounds in weight; and about the same number are reported as having been taken in the Rangitata, averaging about 17 pounds. The run of salmon in the Waitaki this spawning season is far ahead of last year's run. From the number of fish which are now running in the Hakataramea, and judging the other three large tributaries by the number of salmon which myself and assistants have seen in the Ohau River, it is no exaggeration to say that the salmon in the Waitaki and its tributaries this season must number tens of thousands.

"As it has been proved that salmon eggs can now be collected in large quantities, the department has decided on a vigorous policy with regard to stocking other suitable rivers throughout the Dominion. During the past summer a hatchery capable of dealing with half a million eggs was erected on a tributary of the Wairau River (Marlborough), and a site for a hatchery has been secured at Wanaka Lake, where temporary arrangements will be made this season for the purpose of hatching out half a million eggs for the purpose of stocking

the Molyneux River. It is intended this season to allot half a million eggs to each of the three rivers which the department has now in hand—viz: the Hokitika, Wairau, and Molyneux. The result of the inquiries made goes to show that the salmon have spread along the coast north as far as the Wairau (North Canterbury), and south to the Taieri River. The Taieri is at times rather badly polluted by gold mining, but from an examination of the tideway at its mouth, and its condition in the gorge above Outram, I think it is quite possible for salmon to make their way up to the clear tributaries beyond where the races from the sluicing claims join the main river.

"The very rapid increase of the quinnat salmon must be considered as most satisfactory, and the time is very near indeed when they will be placed on the market, and the people of the Dominion will have New Zealand-grown salmon on their tables. New Zealand has the distinction of being the only country in the Southern Hemisphere which has successfully acclimatized salmon, and on the authority of experts it is said to be the only country in the world which has been successful in acclimatizing this salmon away from its native habitat. The success attained in acclimatizing this fish is undoubtedly due to the systematic and vigorous effort made by the Marine Department, commencing in 1900. Had any of these prolific fish survived from the spasmodic efforts made to acclimatize them previous to 1900, they would have declared themselves long before the department commenced its importations in 1900."

BIGHORN SHEEP IN THE VICINITY OF CLAREMONT, CALIFORNIA.

By Leon L. Gardner.

(Contribution from the Department of Zoology of Pomona College.)

That mountain or bighorn sheep still exist in small bands in various parts of the California mountains is a fact well known. It, however, comes as a welcome surprise to find them living, breeding and at least holding their own in numbers, in the mountains not farther than thirty miles from Los Angeles. Vague reports from old hunters that in certain parts of the ranges near Mount San Antonio, commonly known as "Old Baldy," there were "wild goats and sheep," and that they were "mighty hard to get near to," furnished the incentive for investigations which have demonstrated that one species of bighorn sheep occurs in the ranges north of Claremont, Los Angeles County. Whether or not this is the Nelson bighorn (*Ovis nelsoni*) is an open question which can be decided only by the collection and study of specimens.

The rumor relating to the occurrence of wild goats is undoubtedly based upon the observation by hunters of the females and young sheep with their smaller horns. A case in point is the sheep's head found in Ice House Canyon in the spring of 1916. The severe rains of the year had washed it down from the mountainside and it was found at the canyon bottom and brought into Camp Baldy. Word went out that the head of a mountain goat had been found, and the writer immediately

hastened up to the camp to see it. It proved to be the head of a young bighorn, but on account of the short horns and hair, now bleached nearly white through weathering, the mistake had been very natural.

The mountains of the region are much like all the southern California mountains, with brush-covered, south-facing slopes, while the shaded north-facing areas are fairly well wooded. The outstanding feature of this particular region is Mount San Antonio, or better known as "Old Baldy," which stands 10,080 feet above sea level. From it radiate great mountain ridges to the north, east, west and southwest, much as spokes from the hub of a wheel. The whole system is thus connected up by continuous ridges. In this great extent of territory the sheep occupy a very definte area. This includes Ontario, Cucamonga and Telegraph peaks, with their intervening ridges, also Iron Mountain and

Fig. 19. United States Geological Survey topographic map, showing the distribution of bighorned sheep in the vicinity of Mount San Antonio (Old Baldy).

its connection with "Old Baldy," and the ridge between this latter peak and Telegraph (see fig. 19). In the writer's opinion, this is the area of their widest distribution, their favorite haunts being the region around Ontario, Cucamonga and Telegraph peaks.

To seek out and study the sheep in this array of jagged spurs and protecting hollows is a task difficult in itself, and is made none the easier by their timidity. Their wariness was impressed upon the writer by an encounter on June 12, 1915. The approach to Telegraph Peak was made by the ridge from "Old Baldy." While this peak was yet a considerable distance away, the writer's attention was attracted to a spot near the summit by a clear, thin rattling caused by a rock slide down the steep slope. It was apparent that some large animal was the cause of it, and close scrutiny disclosed three heavy-bodied animals bounding up the mountainside with great speed, and with no regard to

the great quantities of stones dislodged. As each sheep in turn reached the summit, curiosity gained the upper hand, and it turned, gazed down in a bland, questioning way, and then with a quick turn, head erect, trotted stiffly over the top and disappeared to view. On account of the hard soil, the tracks could not be followed and pursuit was impossible.

Just what the sheep were doing on that barren rock slide is hard to say. They could hardly have been in the act of quitting the peak, for that particular spot was some distance from any ridge, being on a slope that ended only in the canyon a considerable distance below. If it was food they were seeking, they were certainly going to a great deal of extra effort, for there was plenty at the summit. This was quite evidently a stray trio of more adventuresome or restless females or young males, for no big-horned ram was with them. They might very possibly have been members of a larger band on the other side of the mountain. This seems the more likely in view of the fact that about an hour later, in a location not so very distant from where the sheep were seen, the writer came across fresh tracks of a whole band of sheep.

Just how the sheep detected the presence of a human being is an interesting question. The air was quite still, so they could have received no warning through a telltale scent. It seems more likely they were given notice through the sense of sight. If so, their vision is very acute, for the writer was alone, dressed very inconspicuously and still at a considerable distance.

Another definite encounter occurred in September of 1914. This one was purely fortuitous. A fruitless hunt for deer had at last led to the outermost point on Ontario Peak, and here a rest was taken on the top of a big rock. About midafternoon the silence was broken by faint yet unmistakable sounds, which could have only been made by a whole troop of animals. There was the sound of twigs snapping, the bleating of lambs and the peculiar shuffling sound caused by the tramp of many feet. It was very evident that a band of sheep was approaching. A cautious observation over the edge of the rock disclosed a very interesting sight. Coming along the top of the ridge was a party of sheep, an individual stopping here and there to nibble at the vegetation. The rams, with their great curling horns, were a majestic sight, while the young of the year were exceedingly playful and altogether charming. Unfortunately at this stage a scent warned the sheep. In a second the whole band halted, heads up, noses questioning, then at an invisible signal they all wheeled and made off in jerky, stiff-legged, bouncing leaps, and quickly disappeared from view.

At various other times sheep were seen, but under very unsatisfactory conditions. Either the distance was so great that nothing could be learned, or but a very fleeting glimpse was caught of the band in flight. One is often given the aggravating impression that he comes too late or that the sheep were too sharp-eyed and had taken to safety.

However, although themselves difficult to locate, unmistakable traces of the sheep are to be found if carefully sought. Here one sees the grass cropped, the bushes nibbled, there the scattered droppings, and in spots where the soil is powdery enough, or by a moist stream bank, the clear large footprints in great abundance. One might almost study the distribution of the sheep through this means alone. Thus the writer

one day came across a well-beaten sheep trail on the ridge between Ontario and Telegraph peaks. In most places the soil is too hard and rocky to take a print, hence tracks are not as abundant as one might suppose.

Regarding the general habits of the sheep, several points seem clear. As before noted, they are very shy and alert, despite years of freedom from pursuit by man. From the fact that tracks when found are usually in great abundance, and from direct observation, it is evident that they travel most often in bands. However, the occasional sight of one, two or three odd sheep perhaps points to the conclusion that certain individuals at times stray from or are cast out of the band. This might occur in the case of several males striving for the leadership of the band. It seems very possible that adventuresome young, especially males, not yet arrived at the breeding age, might stray from the herd.

From the appearance of the lambs in late September, at which time they are quite active, the writer would put the lambing season in late February and early March.

The question of water is not a serious one for the sheep. Not only is water accessible in the headwaters of the canyon streams, but springs issuing from the sides of Ontario Peak, at some places within 200 feet of the top, give a ready supply. This whole region in winter is covered with a heavy blanket of snow, and this, when melting in the summer, often forms large pools of clear water. That the sheep move about and drink at night is evidenced by one observation, when several of them were seen one moonlight night to slip down to one of the springs on Ontario and drink.

What constitutes their food can not readily be told without long-continued observations during feeding (a very difficult and well-nigh impossible task) and by a study of the stomach contents. There is no doubt, however, that the following plants form an important part of the diet: the leaves of the chinquapin (*Castanopsis sempervirens*), a wild parsnip (*Palpinacca sativa*) growing around water holes, berries of the manzanita (*Arctostaphylos*), twigs and leaves of *Rhus trilobata* and *Rhamnus crocens californicus*, and finally grass growing near springs and streamlets.

All that has been said applies to the sheep only during the warm season of the year. What becomes of them in winter is not known. They are certainly not at the mountain tops. The heavy snow blanket covering the mountains thaws during warmer spells only to freeze again into a solid sheet of ice. At such times they become exceedingly slippery and dangerous, and it seems inconceivable that the sheep or any living creature of large size could avoid sliding off into the canyons below.

There are two places that give great promise as wintering areas. These are the spurs to the northeast of Cucamonga and Telegraph peaks, respectively. They drop low enough to receive only an occasional, transient snow covering. This region is exceedingly wild, trailless, and not visited by man, and would seem to present all the requirements of winter quarters for the sheep.

Regarding the number of sheep living in this territory, it is not possible to say definitely. If all the sheep are in one band, then their number is between fifty and sixty head. There is, however, no evidence

to show that there are not dozens of sheep scattered all over the range, or that there are not two or more bands of varying sizes. The writer is inclined to feel that there is but one band, with only a few outlying stragglers. Much can be done toward answering these points if the sheep could be found in the winter, when their range is greatly restricted.

A study of this kind presents many other questions of great interest. It would, for instance, be very interesting to obtain, if possible, a history of these sheep. How long have they been known in this section, and are they remnants of a one-time larger band that was more widely distributed? It also seems very possible that there are other bands of sheep in favorable localities, such, for instance, as North Baldy and the series of nontrequented peaks in connection with it. Even the species is unknown, and from this as a starting point the problems extend endlessly.

With a wise and rigorously protective state law and a range that will not for years to come be encroached upon by man, there is everything in favor of a bright future for the mountain sheep of eastern Los Angeles County.

DEER LICKS OF THE TRINITY NATIONAL FOREST GAME REFUGE.

By Harold C. Bryant.

Heretofore, we have had to base our judgment as to the value of a game refuge largely upon the results obtained in The Transvaal in South Africa, and in other states. Convincing evidence of results to be expected from game refuges in California is now available, in that the first of the large state game refuges placed in a national forest has been in existence long enough to demonstrate possibilities.

Trinity Game Refuge was established by legislative enactment in 1911. Comprising 65,000 acres of brush and timberland, with abundant water and feed, and salt licks convenient, the region affords ideal conditions. A visit to this refuge at the present time will attest the worthwhileness of a sanctuary for deer and other game.

Although in a county where violations of the fish and game laws are frequent, the residents respect the game refuge. The people of the county wanted the refuge in the first place, and although it set aside much of the best deer country, everyone concerned is willing to be inconvenienced and to hunt elsewhere. Originally reporting the largest deer kill of any county, a noticeable decrease for several years brought a realization that something needed to be done to save the situation. The result was a demand for a game refuge. The interest taken by the United States Forest Service has had much to do with the attitude of the residents and the enforcement of the game laws.

Within the refuge are many famous deer licks, where in former years deer were killed by the thousands. Residents estimate that there were 10,000 deer killed at the licks near the north fork of Trinity River, up to the time of the creation of the refuge.

Fig. 20. View of portion of Trinity Game Refuge on the Hayfork River. Photograph by H. C. Bryant.

The writer visited the Trinity refuge during the latter part of May, 1917. Trips were made to the licks along the Trinity River near Helena, and also to the numerous licks along the Hayfork River, about ten miles from the town of Hayfork. At both of these places there was plenty of evidence that deer were very numerous and very tame.

Fig. 21. A typical deer lick comprising a mineral spring on the Trinity River near Helena, Trinity County. Photograph by H. C. Bryant.

On May 23, Deputy G. O. Laws and I went early to the large lick about two miles down Trinity River from the town of Helena. We seated ourselves about thirty-five yards away, but in plain sight of the approach and the hillside in the background. After waiting for some time we were rewarded, not only by seeing ten deer within good range along the hillside, but also had the pleasure of having two does come to the lick and spend several minutes there. We attempted to photograph them, but the early morning light was not sufficient to make the pictures successful. It was only after we had stood up to take the third photograph that the deer became sufficiently frightened to leave the lick. Even then they did not run, but simply walked back up the hill. The sand next to the river showed that large numbers of deer

Fig. 32. Doe at deer lick on Hayfork River in Trinity Game Refuge. Photograph by H. C. Bryant.

had been at the lick during the night. All of the deer seen at close range were does; tracks also indicated a large percentage of does. When about to leave, four deer came over the hill and started toward the lick, but they "winded" us before they had gone half way down the hill, and turned back.

A trip, in company with Mr. Shoek, to the numerous licks along Hayfork River, about ten miles from the town of Hayfork, gave even better results. One large lick inspected (Sulphur Spring) had been used during the night, and it was evident that a number of deer had been frightened away upon "winding" us. Even so early in the year trails were cut three and four inches deep. The tracks here indicated a large percentage of bucks.

Farther down the river, we seated ourselves on the bank of the river opposite what local residents have often termed the "Big Lick." We had been there less than five minutes when two deer appeared and spent

some time at the lick. A screen of tree branches prevented photographs being taken. After these deer had left we moved our location, taking up a station directly across from the lick. We were in plain sight and but thirty-two yards away. During a wait of a little over two hours we were rewarded by seeing a dozen deer come to the lick. Several of the animals saw us, and at each click of the camera the head was raised and the ears pointed forward, and yet there was no sign of fright. The climax came when at 10.15 in the morning two bucks and two does came to the lick, and spent five or ten minutes there. (See fig. 24.)

Fig. 23. Deer startled by the click of the camera at "Big Lick" on the Hayfork River in Trinity Game Refuge. Photograph by H. C. Bryant.

The antlers of the bucks at this time of the year were from four to six inches in length, the knob at the end just beginning to indicate a branching. Bucks were most in evidence at this lick, only three or four does being seen.

Probably nowhere in the state is it possible to find so many deer, or find them so tame, as in this Trinity refuge. Evidently the refuge forms a great game farm where the animals increase in numbers and then spread out to surrounding localities, furnishing food and sport for all those who wish.

Natural conditions are of the best. Artificial means may, however, improve the annual crop. Deer in this breeding area, although safe from attack by man, are still subject to attack by many predatory animals. Some work is being done by the United States Department

of Agriculture to reduce the number of coyotes and mountain lions, but still more work along this line needs to be done. Refuges of this kind, even though they have proved their worth, should be more than refuges on paper. They need to be well guarded and at the same time made more effective by the destruction of predatory animals. Attention needs to be paid also to every means of making the deer more prolific.

Fig. 24. Four deer at "Big Lick" on Hayfork River, Trinity Game Refuge. Photograph by H. C. Bryant.

It may be that salt bricks placed in certain parts of the refuge would aid in keeping the animals in good health. This area, at several different times, has been ravaged by a disease which killed off great numbers of deer. Investigations as to the cause and the cure of this disease would also be of value in increasing the effectiveness of the area. During certain years winter feeding might prove worth while.

The creation of the Trinity Game Refuge has assured a permanent supply of big game to Trinity County and is demonstrating to the whole state the benefits which accrue as a direct result of proper game protection.

UNAPPRECIATED FRIENDS.*

By John G. Tyler.

It is a well established fact that any disturbance of natural conditions in a given area, whether brought about by drainage, irrigation, deforestation or a change in crops or natural products, has a marked, and sometimes immediate effect, upon the Flora and Fauna of that region, and this has been demonstrated in a very striking manner in the San Joaquin Valley, where we are accustomed to do large things and to do them quickly. In this valley, when we speak of an irrigation project, it is usually not in terms of acres or hundreds of acres, but of thousands of acres. The effect of draining large areas of marsh land and converting such tracts into grain fields has been to metamorphose completely the wild life of such places, while the constant transformation of previously uncultivated tracts into fruit orchards and alfalfa fields has brought about equally startling changes.

In days not long passed stock raising was the principal occupation in many parts of the San Joaquin Valley and among our older residents there are still not a few who can recall the time when magpies were as common as sparrows and the sight of glistening flocks of snowy egrets was an everyday occurrence. Then, too, the great California vulture, or condor, swept over the valley searching for carrion on which to feed before returning to its favorite cliffs in the Coast Range Mountains. Dr Heermann, a naturalist with one of the parties of the Pacific railroad surveys, recorded in 1859, that they found the bald eagle in the Tulare Valley, on the borders of large lakes, and in one place counted three nests within sight of each other. The accounts of these explorers are most interesting reading, but we can not escape a feeling of sadness as we realize that these and many other birds have all but disappeared forever from nearly every section of our country.

The stock men did not hesitate to destroy eagles at every opportunity because occasionally a lamb was carried away or a weakling calf was killed, albeit the eagle much preferred a diet of fish or the ducks and coots which he could pick up along the streams and ponds. The destruction of magpies and condors, however, was brought about by wilful carelessness and indifference, for the condors, especially, lived almost entirely upon carrion and could not be charged with destroying either stock or wild game. It was poison indiscriminately placed in the carcasses of cattle and sheep to kill coyotes, lions and other animals that decimated the ranks of these splendid birds, and had not stock raising given away to grain farming, California would soon have lost its right to claim the largest North American bird.

With the advent of vast fields of grain a new set of problems began to confront the settler and the large carnivorous animals were no longer a menace. However, new enemies soon appeared in the shape of ground squirrels, gophers, mice and rabbits which annually destroyed untold bushels of grain. But, here again a lack of foresight was manifested for instead of exterminating these rodents, we began a concerted persecution of the very creatures that fed upon them. Golden eagles and the large slow-flying hawks sought the squirrels by day, and at night several

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species of owls preyed upon the smaller mammals; yet every man's hand was against these useful birds and when an occasional fowl disappeared as a result of a visit from some swift-winged falcon, the event was heralded far and wide as absolutely indisputable evidence that all large birds are blood thirsty destroyers of poultry, and even when a very small amount of investigation would have shown that a weasel or fox was responsible for the loss, it was much easier to place the blame on a "hen hawk" and wage unceasing persecutions on all members of the hawk family, both large and small.

In 1878 Lyman Belding, one of the pioneers in San Joaquin Valley ornithology, secured several specimens of the white-tailed kite, which were sent to the United States National Museum for examination and study. In describing these Mr. Belding wrote as follows: "This is a common constant resident of Stockton, where I have seen as many as twenty at the same moment within a circle of half a mile. The specimens I sent were stained * * * from catching mice in a large alfalfa field in the reclaimed tule ground."

In 1915, Dr. Joseph Grinnell of the University of California, after exhausting every means for obtaining information regarding this species, was forced to say: "It is now everywhere very much reduced in numbers and restricted in range, with promise of early extinction." What a pity it could not have been spared to continue its useful work.

But even now when the grain fields have been replaced, to a large extent, by vineyards; when alfalfa fields spread a green carpet over acre after acre, and when the blossoming fruit trees impart a fragrance and beauty to the entire valley, the conservationist has difficulties to face; for with far too many of our farmers it is the rule to regard with suspicion any small bird seen about the farm, and even the wholly insectivorous species are given scanty welcome. Any bird seen on the ground in the gardens or fields is put down as having been caught in the act of digging out seeds or pulling up sprouting grain, and if it ventures near the orchard it is immediately charged with picking off buds or eating fruit.

It is inevitable that in the evolution of a vast empire like the San Joaquin Valley from virgin soil to the most productive area of equal size in the world, we must lose certain species which, from the esthetic standpoint it is highly desirable to preserve; but we can not expect the practical, up-to-date agriculturist to give heed to any argument which embraces nothing more than mere sentiment. Fortunately, however, many farmers have come to realize that from a cold dollars and cents point of view they can not longer afford to be uninformed regarding the economic value of each and every wild creature in their neighborhood. It is too late now to waste time in idle regrets over past mistakes and neglected opportunities, but no well-informed student of these problems would gainsay the fact that our farmers might have been saved many thousands of dollars during the past few years if all concerned had been better informed along these lines.

A short time ago we read of a commissioner being sent to a foreign country, at an expense of several thousand dollars, to discover, if possible, an enemy that would prey upon a certain insect pest. This necessity might possibly never have arisen had our native birds been allowed to carry on the work which nature intended for them.

Even now we are in the midst of a far-reaching and expensive campaign against the destructive ground squirrels, which have increased just in proportion to the decrease of their natural enemies, the raptorial birds. Our horticultural commissioners, too, are searching far and wide for new insecticides and sprays for the control of insect pests, and when we recall in connection with this latter statement the fact that the stomach of a single Brewer blackbird, taken for examination, was found to contain 374 larvæ, 65 pupæ, and three adult alfalfa weevils, besides several other bugs, we can not but reflect that possibly our efforts were too much in one direction.

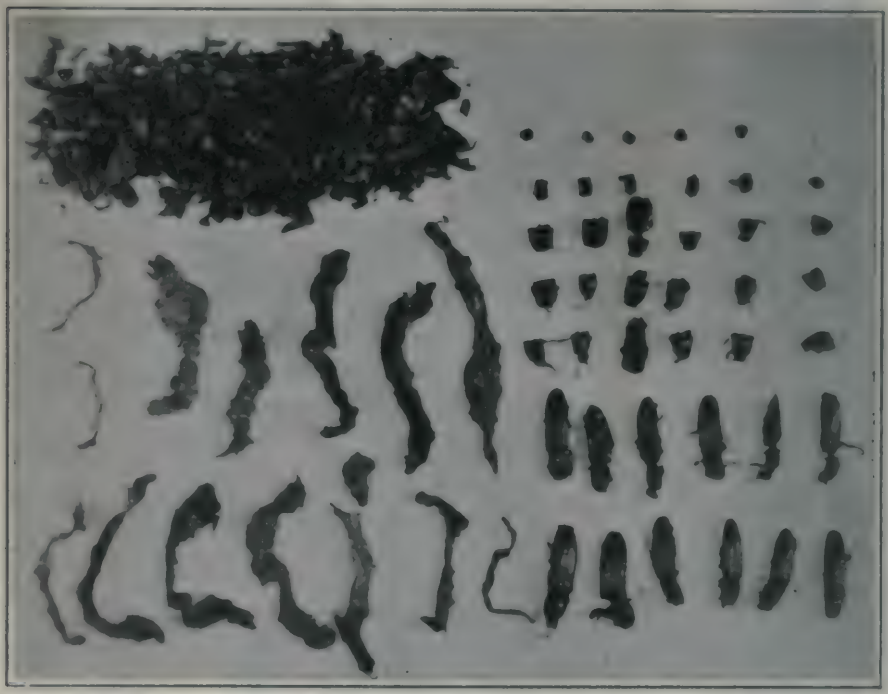

Fig 25. Photograph showing stomach contents of a western meadowlark. This stomach contained thirteen cutworms, twenty-six clatterel beetles, the larva of which is the wire worm, and ten small ground beetles. Photograph by H. C. Bryant

Lest some might misunderstand the author's purpose in presenting this article, let it be understood that this is not a plea for mere indiscriminate protection to any and all wild birds, for such a course would be, in a measure, almost as ill-advised as the one we have been pursuing.

There is urgent need in the San Joaquin Valley for a thorough and systematic study of our birds in relation to the farmer and his crops. This is one phase of our instruction in scientific farming that has apparently fallen just between the work of the farm adviser and the duties of the horticultural commissioner, with the result that we are still woefully in the dark when we seek information along this line. Several of the eastern states have recognized this need and are meeting it by appointing a competent official whose duty it is to carry on field

and laboratory investigations, giving advice to farmers, and to issue bulletins from time to time giving the results of his studies. In carrying on such work it is sometimes necessary to destroy a limited number of birds in order to make a correct analysis of the food that has been eaten, but this loss is more than compensated for if the skins of such be preserved as scientific specimens, as they serve a useful purpose in assisting farmers to identify the various species with which they come in contact, and are always of great value for school work. The cost of equipping a small museum and laboratories and of carrying on the necessary work is but the merest trifle when compared with the far-reaching and lasting benefits to be derived.

Because of geographical and climatic conditions the San Joaquin Valley offers peculiar problems. We can not take advantage, to any extent, of the knowledge gained in other states as our avian population differs even from that of other parts of California. Several species have gone forever; others are becoming more scarce each year, but we can not hope to create a widespread public sentiment in favor of their protection until we can show conclusively that it is to everybody's advantage to encourage their presence.

Shall we continue to neglect this important work until some insect outbreak forces us to action, or shall we acknowledge our obligation to ourselves and the future settlers of the San Joaquin Valley?

CALIFORNIA FISH AND GAME

A publication devoted to the conservation of wild life and published quarterly by the California State Fish and Game Commission.

Sent free to citizens of the State of California. Offered in exchange for ornithological, mammalogical and similar periodicals.

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All material for publication should be sent to H. C. Bryant, Museum of Vertebrate Zoology, Berkeley, Cal.

January 22, 1918.

"More fish and better fishing; more game and better hunting; more sport and better sportsmanship."—GOV. JAS. WITHYCOMBE, of Oregon.

FISH AND GAME ENDANGERED.

These are the times when wild life is greatly endangered. Market hunters in New York and in other states are attempting to again establish the sale of game. Selfish hunters are advocating the free killing of fish and game in order to furnish increased food supply during the period of the war. Even officials, forgetting the need of conservation for the future, are being persuaded to let the bars down. A telegram recently referred to the California Fish and Game Commission and signed by a government official advocated the setting aside of protective laws for sea fish during the period of the war. This request is particularly interesting in view of the fact that with no protection, salmon, striped bass, shad and many other anadromous fish could easily be exterminated within a few years, and furthermore that the larger markets have been so glutted with marine fishes that tons have been sent to the fertilizer works and fish meal factories. We may expect still greater pressure by selfish interests and by those who forget in the emergency that now of all times there should be a strengthening of protection, rather than a lessening. Unless every conservationist stands squarely for sufficient protection to perpetuate game species, the enemies of wild life will make short work of our wild life resources by taking advantage of the present situation.

RICE DAMAGE BY DUCKS.

There has been much newspaper publicity given to the depredations of ducks in the rice fields of the Sacramento Valley. It appears that some of this publicity has been the work of selfish hunters desiring to hunt ducks before the season opens. Proof of this is apparent in the fact that most rice growers will not allow duck hunters in their fields. On the other hand, it appears that some growers have received severe loss from ducks. Certain it is, also, that many of the ducks shot this season had their crops filled with rice. The Fish and Game Commission realizes that the problem of protecting the rice fields in the Sacramento Valley is a serious one and it is anxious to reach a solution fair to both the grower and the hunter. Especially is it desirable to rightly settle the controversy, owing to the food situation. Consequently, the Commission plans to hold in the near future a conference with rice growers to obtain their point of view. Furthermore, during the fall of 1918, a special investigation will be made in those districts where depredations are reported.

NEW PATROL BOAT FOR SOUTHERN CALIFORNIA.

During the last part of December the new patrol boat, which is to be named the "Albacore," will be launched from the Fulton Shipyard at Wilmington. This boat is to be used for patrol work and scientific investigation along the coast of southern California. Although designed on lines similar to those of the tuna boats, it is nevertheless suitable for special work, ample deck room being made for handling nets and other apparatus used in investigations (see Fig. 28). The boat is built of wood, has a length of sixty feet, a beam of twelve feet and a draft of five feet. The interior arrangement provides for a large stateroom giving comfortable quarters for four, and a laboratory.

A 65 h. p., four-cylinder, Acme gas engine will furnish the motive power.

This engine will be installed during the month of January. Mr. H. B. Nidever has superintended the work of construction and has seen to it that the boat meets the requirements in every respect.

BOUNTIES.

Some interesting bounty figures from the State of Wisconsin convincingly prove the ineffective and wasteful system instituted in many states to reduce predatory animals. Did Wisconsin get its money's worth between 1908 and 1916 by paying the following amounts in bounties on wolves, lynx and wildcats? Nor do these figures give evidence of the fraud which invariably accompanies the bounty system.

1906	$61,522
1907	51,068
1908	49,248
1909	47,706
1910	40,428
1911	35,934
1912	35,586
1913	38,126
1914	42,928
1915	42,764
1916	30,198
Total	$480,428

We very much doubt whether the saving was anywhere near commensurable with the amount paid, and yet not a session of the legislature goes by but a bounty system is proposed for our own state.

ATTENTION, TRAPPERS!

In order to give proper protection to fur-bearing mammals before it is too late, a trappers' license law was passed by the last legislature. It is now necessary for all trappers over eighteen years of age "who trap for profit" to obtain a trapper's license (citizen, $1.00; alien, $2.00). Those under eighteen years are required to obtain a license, although no fee is charged. Each licensed trapper is required to report his catch before July 1 of each year.

The more notable provisions of the law are as follows:

Open season for black or brown bear, ring-tail cat, coon, pine marten, fisher, wolverine, mink, skunk, river otter, and fox November 1 to March 1.

No open season for beaver or sea otter.

It is unlawful to use poisons in taking

Fig. 20. Joint exhibit of the United States Forest Service and the California Fish and Game Commission at the State Fair, 1917. Courtesy U. S. Forest Service.

fur animals or to dig or smoke out skunks from dens.

Fur-bearing animals may be killed at any time when destroying property.

Seals and sea lions are protected at all times in Game District Nineteen.

There are no legal restrictions to the propagation of fur-bearing mammals in the state.

FORESTRY AND FISH AND GAME EXHIBIT AT STATE FAIR.

The odor of mountain forests and the sound of running water greeted the visitor to the joint exhibit of the California Fish and Game Commission and the United States Forest Service at the State Fair, held in Sacramento, September 8–16, 1917. Avoiding artificiality as far as possible, the exhibit took the form of a miniature forest, in which was to be found a Forest Service lookout tower, aquaria containing several varieties of fine large trout, a model hunter's camp, with bags of different varieties of game hanging nearby, and a pond with thirteen different species of waterfowl upon it.

Pine, fir and cedar trees were brought from the Tahoe National Forest, near Grass Valley, and a space fifty feet square was turned into a forest. On entering between rows of pines and firs, the visitor was invited to inspect the lookout tower, where an attendant explained the manner in which forest officers discover and locate forest fires. There was also on exhibition a heliograph, an instrument utilizing the sun's rays to flash messages.

Beneath this lookout tower an ingenious method of showing the five principal causes of forest fires was to be found. The rotation of a wheel-like structure brought in view a series of small models showing automobilists dropping cigarettes and matches, homesteaders burning brush, campers leaving a camp fire still burning, lightning striking a tree and a railway train, from which sparks might start a fire. A touch of realism was added to the lightning scene by the use of an induction coil and a piece of tin, with which a semblance of lightning and thunder was obtained, and to the forest fire by the use of volumes of smoke.

Fig. 27. Part of educational exhibit of California Fish and Game Commission at State Fair, 1917. The mountain lion is represented as killing a fawn, and details as to the destructiveness of this animal are given on the accompanying placard. To the right is shown canned fishery products and data on California fisheries. Photograph by H. C. Bryant.

The fish exhibit consisted of a model fish ladder and a fish screen in operation, a small cement pond containing many of the food fishes which have been introduced into the Sacramento and San Joaquin rivers—crappie, bluegill sunfish, black bass and carp, and two large glass aquaria containing rainbow, Loch Leven and eastern brook trout. Hatching troughs contained trout and salmon fry.

Inside the tent, which represented a hunter's camp, was an educational exhibit. Attracting most attention were several mounted groups; a mountain lion killing a deer, a Cooper hawk killing a quail, and a barn owl with a gopher. These groups appeared to impress every visitor and even had they not been

labeled, the meaning of each would have been self-evident. Some fine photographs of birds, furnished by W. L. Dawson, of Santa Barbara, an exhibit of different varieties of tuna and sardines canned in California, and an exhibit showing the

were a pair of wood ducks and a pair of fulvous tree-ducks, the latter birds more like geese than ducks, and often known as "Mexican ducks." Although nesting in the San Joaquin Valley, they are seldom seen during the open season on water-

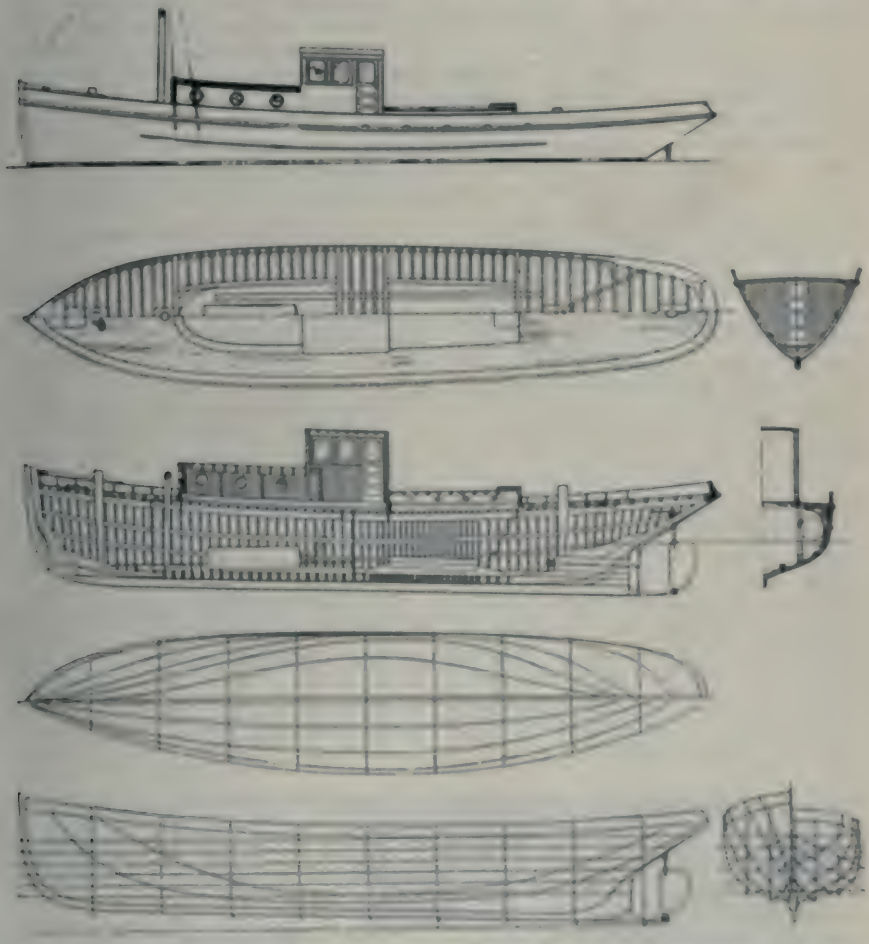

Fig. 28. Working drawings of new commercial fisheries patrol boat. This boat will be used in connection with fishery investigations and patrol work on southern California

food habits of some of the non-game birds, together with charts and maps, completed this part of the exhibit.

A pen containing a pond, on which were to be seen thirteen different varieties of wild ducks and geese, gave those interested a fine chance to test their ability to recognize the different species in the wild. Of more than usual interest

fowl, and consequently are little known by sportsmen.

That visitors were really interested in the work of the two organizations concerned with the conservation of forests and wild life was evidenced in the great demand for literature, and by the many questions asked of the attendants. The exhibit demonstrated methods of conserv-

ing natural resources and showed what the Forest Service and the Fish and Game Commission are doing to perpetuate California forests and California fish and game. The educational value of such an exhibit can not be overrated.

THE COST OF RAISING PHEASANTS AND DUCKS.

In that such game birds as pheasants and wild ducks are fast coming to find a place in the market, and in that there is increased interest in game farming, attempts are being made to estimate the cost of rearing such birds. Samuel Evans, the largest commercial game breeder in the United States, figures the total cost of rearing a pheasant as somewhere between one dollar and a half and two dollars. Mr. Dunn, of the Clove Valley Rod and Gun Club, maintains that one dollar and a half is close to the correct figure for the rearing and maintenance of a pheasant for a full period of twelve months. Mallard ducks can be reared for a slightly less cost.

THE ENABLING ACT OF THE FEDERAL MIGRATORY BIRD LAW.

The Federal Migratory Bird Law became effective March 4, 1913. Because it was claimed that this law was unconstitutional, it has been difficult of enforcement. While the case was still pending before the Supreme Court, the United States and Canada ratified a treaty protecting migratory birds, which in effect made the Federal Migratory Bird Law apply over the greater part of North America. It is still necessary that an enabling act be passed to reinforce this law. Such an act was introduced in the House of Representatives, but failed to come to a vote before the term of Congress expired. The bill was reintroduced in the next session and was passed by the Senate on July 30, 1917, by a large majority. Action by the House was prevented owing to the pressure of war legislation, but doubtless the bill will be passed before the session closes. The Canadian Government has already passed its enabling act.

SAVING DEER FOR FOOD.

The United States Department of Agriculture, along with other recommendations, suggests the following ways of more largely utilizing the deer kill. Fortunately, some of the suggestions are enforced by law in this state:

"Do not kill a spike buck or doe when you can obtain a full-grown buck.

"Do not kill deer when weather conditions or difficulties of transportation prevent saving the meat.

"Save every pound of meat.

"Save the skin and the head also if the antlers are in good condition.

"Do not shoot deer at night, or in the water, or unless you can clearly see that the animal aimed at is a full-grown buck. Failure to observe this rule usually results in a violation of the game laws and often in the loss of human life."

Fig. 29. The results of a hunt at the opening of the season in Mendocino County. Each of the nine men in the party secured a buck.

NOVEL FISH AND GAME LEGISLATION.

A recent publication of the United States Department of Agriculture (Farmers Bull. 910) in giving a summary of the game laws for 1917 calls attention to the following novel game legislation:

The first game law placed on the statute books of any state through the medium of an initiative petition was adopted in Arizona at the general election in November, 1916.

Hunting game with flying machines has been made illegal in North Carolina by a law prohibiting shooting waterfowl on any of the waters of the state from an airplane.

Pennsylvania has imposed, as a penalty for conviction for a second offense under the game law, imprisonment equal to one day for each dollar of the fine and denial of license to hunt for two years.

Utah has passed a law prohibiting aliens from hunting in the state.

Wisconsin has extended its provision relative to seizure of paraphernalia used in violation of game law to include automobiles, which, when used by persons hunting illegally, may be confiscated by conservation officers.

The law in New Hampshire authorizing the payment of damages for injuries to live stock caused by persons hunting deer has been modified so that in future such damages will be assessed by the commissioner of agriculture and paid from the fish and game fund.

In South Carolina a specific tax on game preserves was imposed on all holdings in excess of 5,000 acres, except in Berkeley County, the rate of taxation being 2 cents an acre for tracts of 5,000 to 30,000 acres, 4 cents from 30,000 to 55,000 acres, and 5 cents for larger tracts.

Wyoming has provided for the establishment of zoological gardens in cities and towns and authorized the game commission to supply birds and animals for the collections.

Hunting on Sundays is prohibited in all states and provinces east of the one hundred and fifth meridian except Illinois, Louisiana, Michigan, Texas, Wisconsin, and Quebec.

Section 8 of the Canadian Migratory Birds Convention Act reads: "All guns, ammunition, boats, skiffs, canoes, punts and vessels of every description, teams, wagons and other outfits, decoys and appliances of every kind, used in violation of or for the purpose of violating this act or any regulation, and any bird, nest or egg taken, caught, killed or had in possession, in violation of this act or any regulation, may be seized and confiscated upon view by any game officer appointed under this act, or taken and removed by any person for delivery to any game officer or justice of the peace."

RECREATION.

I know there is not a man living who is tossed about month after month in the bustle and bang of business life who does not need a vacation; he needs it for his mental, moral and physical development; he needs the woods, the music of our streams, the warbling of the birds, and a chance to drive out the fetid air of a stuffy office and dusty street and to fill his lungs with pure, vigorous ozone found in the woods and open fields.

It is a misfortune to a man who does not enjoy Nature's greatest tonic, which she presents so freely in outdoor life. Sometimes there comes a longing to all of us for a camp fire in some shaded spot close to some good spring of pure water, with a frying pan over the coals, from which comes the scent of bacon. All of this can be found only in a life in the broad and health-giving open.

The greatest charm of nature is its wild life. The beauty of the hills and the mountains would be cold and desolate without the birds and animals that have delighted man since the beginning of time; music of the rivers and streams would be sad were it not for the sport of "going a-fishing."

Society is unconscious of the contentment to be found under the open sky and in the silent places. Natural things are wholesome, and a finer view of life and deeper sympathy with and for all living things is found along the primitive paths. Men and women all over the world are yearning for the simplicity of other days; are groping to find greater moral and physical strength and true happiness, which is apparently lost.—*Biennial Report, 1914–1916, Kansas State Fish and Game Warden.*

MUDHENS GOOD FOOD.

Believing that "conservation" means making use of every valuable food-product, the California Fish and Game Commission has launched an extensive publicity campaign in behalf of the common coot or "Mudhen," which already has established itself as a valuable bird in the South and parts of the East, but in the presence of so great a supply of more choice wildfowl, thus far has failed to find general recognition in the Golden State.

This is a time when everything edible should be given careful consideration; for months the Fish and Game Commission urged upon the people the greater use of fish, and in the present phenomenal increase of demand is seen a considerable ripening of the fruit in whose cultivation the commission was a pioneer on the Pacific coast.

The using of all perishables, and becoming better acquainted with every novel food product has become a patriotic duty wherein all may render aid of daily value. Realizing that only through wide publicity could the people be made familiar with the many good foods that annually go to waste, the State Board has been stimulating all possible the use of birds that most hunters throw away—a thing for which there can be no excuse, as if not worth using, why kill, or waste costly ammunition that could serve better purpose?

The worst thing about the "Mudhen" is its name, and the prejudice that this has built up against it. "Give a dog a bad name" has proved its truth. As a matter of fact, there is nothing new in the use of mudhens on this coast. Leading hotels have served them as "water chicken" in San Diego for years; and as "tule hen" they appeared on Fred Harvey's celebrated bills of fare regularly. Known South as "Poule d' Eau" and served a la Creole, they attained a more than local fame down New Orleans way, great center of bon vivants that it is.

Mudhens are perhaps better relished by their French name which is more truly descriptive of their habits, as they are a water bird rather than a mud frequenter. Their diet is identical with that of ducks, and in dry seasons when there is not much grass the flesh stays hard. In general they are to be handled like rabbits in preparation for the table. Stews are the general method of cooking; but those willing to pluck fat ones can roast them and have a bird little inferior to duck except milder in flavor, hence relished by some to whom the gamy flavor of a duck is not acceptable. They are easy to skin, but the process removes the rich and valuable fat, so is to be condemned, as all such fat should be made useful. To add other fats, such as bacon, is needless extravagance.

Soaking the birds several days in cheap claret imparts a most delicious flavor, and is a method followed by some of the most celebrated cooks, one of whom has been serving "mudhens" in his cafe for nearly twenty years in Los Angeles as "Salmi of Duck," delighting thousands who never suspected that they were eating the same mudhen that had been left to lie before their guns as supposedly worthless.

Nowadays, as a result of publicity, one sees strings of the blackish birds, nor are sportsmen ashamed to admit their shooting them either; for the making use of anything hitherto wasted is realized to be a most practical form of patriotism, and to be a proper source of personal pride.

The common ruddy duck or "wiretail" is a delicious bird on the mountain lakes when fed on the rich, sweet aquatic food-plants so relished by the big ducks, and sportsmen are also making wide use of these fat little fowl this season.—EDWIN L. HEDDERLY.

WILDFOWLERS LUCKY.

Favored by the wonderful balmy weather of a typical southern California winter, sportsmen have played in phenomenal luck throughout the present season until a week before Christmas finds the mountain lakes still open; the highways and by-ways still easily passable everywhere; a goodly supply of waste grain, weed-seeds and much natural food for wild game still unspoiled by rains. With the greatest duck and goose flight of any recent year reported from the interior valleys along the great rivers, and a good supply of birds on the mountain lakes which remain open to the

licensed hunter legally as well as climatically, the vast army of wildfowlers who are unattached to any clubs find themselves favored indeed by the continued delay of storms, which, although making better shooting, render the grounds difficult of access to the motorist who is willing to travel 150 or more miles for his week-end outings. The growth of the "good-roads" movement in California has greatly increased this class; until today, considering the comparative ease of access to the vast open shooting-grounds of the interior, the charge no longer rings true that one "must belong to an expensive gun-club to enjoy duck-shooting in southern California." There never was a time that men could not find better shooting away from the clubs, but it was not so accessible as now; and this year the clubmen have had a bad deal indeed from Nature. The scarcity of food in the extreme south where none of the clubs appears to have attacked the problem from a duck's point of view, has been accentuated by the increase of beet and bean farming which largely has replaced the barley-growing which used to provide sprig and wigeon with their principal staff-of-life hereabouts; and the clubmen have failed to provide any practical pond-growing substitute to take its place. Over-shooting and under-feeding are an impossible combination especially when coupled with mild weather, which offers no reason for ducks leaving the favorable feeding conditions of the great interior valleys, which have become more attractive since rice-growing was proved practicable, and now constitute such a paradise for wildfowl as probably can not be equalled anywhere else in the world.

California long since became famous among wildfowlers who watch their favorite sport in a broad, nation-wide way. From the days of '49, the vast inland waterways of this state have ranked as immense producers of wild game for food and sport. Today, despite a winter of typically Californian mildness, the entire interior of the state is swarming with ducks and geese of every coastal variety. The demonstration of formerly waste overflows as the best of rice land has added an enormous pulling power to the already proved attractions of the Sacramento and San Joaquin, Owens and Imperial valleys. Sportsmen well may be proud of their state, and glad to cheerfully contribute their license-dollars toward keeping up its gunning attractions, which draw the interest of their fellows of like mind with a magnetic power only to be appreciated by those in whom the love of wild life and healthful sport in the great outdoors still surges with primitive enthusiasm.

In the day of our National need, when this vast plenty of choicest wild meat lies open to the people free to whomsoever has the energy, experience and ability to "reduce to possession" these assets which belong equally to all until the superior prowess of some has rendered them personal possessions, the state's game has developed a peculiar and direct value, as a thing to be used wisely like an investment, its taking limited to the annual increase, lest a day of direr than present need develop when a greater than present supply must do its first duty by the people in the replacing of shipable meats. To this end exist all our restrictive laws; and those whom the limit seem to hit hard must not forget the reasons underlying it; nor the liberal privileges they enjoy when compared with the all but gameless states of the east, where drastic closed-seasons and small mess limits have utterly failed to stay extermination in the face of advancing agriculture and closer, more intensive farming methods. The game is given us to use wisely: not to set up on a pedestal of affectation as a monument to posterity; but for the best and widest present use compatible with maintaining the supply on a business basis for the future, exactly as any business man aims to handle his working capital.—Edwin L. Hendrley.

HOW TO DYNAMITE A STREAM.

Newspapers have been one of the most powerful forces in crystalizing sentiment in some of the states for the protection by proper laws of fish and game as important resources of the commonwealth.

A New Jersey editor, a thorough sportsman, recently received from a

reader who desired to take fish by questionable means a query saying:

"Please advise me how to dynamite a stream."

The newspaper man sent the following advice:

"Four sticks of dynamite are sufficient. Tie them securely around your neck, attach fuse, light it and run as fast as you can away from the water to avoid injuring the other snakes and reptiles."
—*Wild Life*, September, 1917.

MT. WHITNEY HATCHERY GROUNDS TO BE IMPROVED.

Mr. John McLaren, the well-known landscape gardener of Golden Gate Park, San Francisco, recently made a visit to the Mount Whitney Hatchery for the purpose of offering suggestions as to the improvement of the grounds. The large amount of water which passes through the hatching troughs is to be utilized in beautifying the surroundings. The natural boulders, so numerous in the vicinity, will be utilized to form cascades, and shrubbery and trees will be planted to give a suitable background. Mr. McLaren gave helpful information as to the grouping and kinds of trees and shrubbery to be used.

FIREWORKS USED TO FRIGHTEN BIRDS IN RICE FIELDS.

Some experiments to determine the effectiveness of fireworks in frightening birds from rice fields have recently been made in the Sacramento Valley. The location selected was on the Gingg and Cooper ranch, four miles west of Live Oak, where birds did considerable damage last year.

In talking with Mr. Cooper in September regarding cooperation by the Fish and Game Commission in order to find a remedy, and knowing the effect of black powder, which is both loud and smoky, we suggested to him the use of some form of loud explosive that would carry fire and smoke. We secured several samples of rockets and bombs from San Francisco and commenced the experiment by setting some of them off after dark. However, the birds were still numerous on the rice fields at daylight in the morning. We then fired more bombs and still more while the birds were in the air. To say that the ducks were demoralized does not convey an idea of how much they were frightened.

Mr. Cooper was so impressed with the effectiveness of the bombs that he sent for four dozen of the kind selected, at five dollars per dozen. After using half of this number night and morning there was not a bird of any kind to be found on his fields. In a few days some mudhens and ducks returned, presumably new ones. He then used the balance of the four dozen effectively, and sent for five dozen more for emergency use. On September 26 Mr. Cooper stated to us that he had had no occasion to use or open the last five dozen, as at that time there was not a bird on his fields and he had not suffered a particle of injury. Judging from this, the experiment may be said to have been a success.

Conditions on Mr. Cooper's fields made it harder to protect them from the birds than any other fields in the district, the water being deeper in spots, which induces the birds to congregate there. Of course, when the birds were driven from the Gingg and Cooper grounds, some of the other growers certainly suffered from the addition of these birds. This only demonstrates that entire relief for all growers can only be had through the cooperation of all the growers. Each can protect his fields, but the one who does not will be the greatest sufferer.

We are certain that the experiment referred to above is the only logical remedy, although many other methods have been suggested. Some rice growers, and many who are not growers (and, by the way, the last named class is the loudest in its complaints) have advocated an earlier open season for ducks. This positively will not remedy the situation. It might, if every one would kill blackbirds and mudhens, as well as ducks, but they want to kill ducks only, as the other birds are not considered good eating. So by killing ducks only, the worst menace would still remain. Again: The rice grower will not permit trespassing on his fields, as the hunter will do more damage at this time than the birds. Many of the rice farms are posted with signs prohibiting shooting and trespassing. Further, if the season was opened earlier than at present, a large number

of club members would be out shooting at the club grounds, which are not on the rice fields, but on open water and tule marsh lands adjacent thereto. Thus the ducks would be driven from the club and open shooting grounds back to the rice fields, where the rice farmer does not permit trespassing while the rice is growing. Consequently, the club members would be the only ones benefited by an early season, while the rice would suffer more than at present.

Before night shooting was prohibited, and before the use of smokeless powder, some of the best duck shooting ponds have been spoiled by shooting after dark and by using black powder. Any duck hunter of long experience can testify to this. Ducks will not return to a pond that has been shot on at night. The idea of using bombs came from this experiment. Smokeless powder is used in fixed ammunition because it does not frighten game, for it makes very little noise and smoke. The use of smokeless powder to scare ducks is money wasted. This form of ammunition is made to kill, not to frighten, but it has been used by the rice grower and he receives no relief except from the bird he kills.

Although the experiments above outlined were tried on a limited area only, they demonstrated that there is a feasible method of protecting crops from the depredations of birds.

We are sure that if the rice growers themselves will cooperate, a plan of defense can be worked out as suggested, which will make it unnecessary to threaten the extermination of the wild duck without obtaining relief from the other birds which are the worse menace. But the growers should eliminate the voice of the man who is not a rice farmer, and who only takes up the cry for the purpose of slaughter. He does not kill mudhens or blackbirds, because he does not eat them and cannot sell them.—George Neale.

BLACK BEAR WORTH PROTECTING.

The recently enacted "bear law" was one of the best measures the Fish and Game Commission has ever succeeded in placing before the state legislature. It will effectually put a stop to the ruthless slaughter of these animals at a time when they are utterly valueless. I have heard owners of two-bit "bear hounds" boast of having killed as high as forty bears in one summer in order not to "spoil" the pro-German dachshunds who had treed them. One bear is of more value to the community than a dozen of these worthless sausage hounds, who make the night hideous with their fiendish howls, as they chase the does and fawns up and down the mountainside.

To the average mountaineer bear meat is preferable to venison. To mention bear meat in their presence is to cause a sensation similar to that produced by the mention of "sweet 'taters an' 'possum" in the presence of the congregation at a colored camp meeting.

The meat, lard, and pelt of a three-hundred pound bear in prime condition represents an actual value of over thirty-five dollars. In addition to this, outside hunters whose love of bear hunting attracts them to the mountain regions doubtless spend in transportation, license, food supplies and indicentals, an actual value of over one hundred and thirty dollars to the community. The small amount of damage done by an occasional "hog killer" is greatly offset by his value as an asset to the state, and as a source of food supply to the residents of the districts he frequents. The lard and oil extracted from a bear in good condition sometimes amounts to as high as fifteen gallons, but five gallons is probably the general average. This lard and oil, if used for culinary purposes, will prove very acceptable to the delicate stomachs of those afflicted with dyspepsia or other stomach ailments.

During the open season there will undoubtedly be many hunters who will kill bear for the pelt alone, and the meat will be left as food for coyotes. At any time and more particularly at the present time, when it is our duty to conserve the nation's food supply, it is a crime to allow this meat to become a total waste, and we sincerely hope that immediate steps will be taken to prevent it.—Frank B. Hoffman.

A WAY TO CURB HUNTING ACCIDENTS.

In looking over a list of the hunting accidents for 1916, it occurred to us that some method should be devised whereby these could be curtailed.

How would it be to require answers to a printed list of questions to be furnished to all parties applying for hunting licenses—a sort of examination: for instance:

1. In getting through a fence, how would you handle your gun?

2. While riding in an auto or other vehicle, would you have your gun loaded or empty?

3. Would you ever, under any circumstances, get into a boat or vehicle with a loaded gun?

4. Would you ever point an empty gun at another person?

5. Would you ever permit any part of your person in front of the muzzle of your gun?

6. If hunting in brush or thicket, would you shoot if you saw a movement of the brush?

It seems to us if all applicants were given a good quiz along this line, it would save many lives and limbs.—O. S. Phillips.

HUNTING ACCIDENTS.

Out of forty-eight fatal hunting accidents last fall in Illinois, Indiana, Iowa, Michigan and Wisconsin, recorded in the Chicago *Tribune*, twenty-two occurred in Michigan as against only six in Wisconsin. The reason for the disparity is simple; bucks only might be killed by deer hunters in Wisconsin, but in Michigan they did not have to wait to see the horns.—*Recreation*, November, 1917.

FAWN SUCCESSFULLY REARED.

On July 8, 1917, Mr. George C. Walker discovered a dead and partly devoured doe in the vicinity of Squaw Valley. Nearby lay a baby fawn about a week old, in a starving condition. Mr. Walker immediately took care of the fawn and carried it to his home at Illikee, on the banks of the Truckee River, where he carefully fed it on a bottle, and in less than thirty days the fawn was able to be up and around.

Mr. Walker applied for and received permission from the Fish and Game Commission to keep the fawn, which was duly christened Tillicum (in the Indian language "Good Luck"). Mr. Walker's airedale dog and the fawn became great pals, and the two roamed the hills at large, always returning, however, for meals. In a short space of time the fawn became such a pet that at times it was almost a nuisance (see fig. 30).

Fig. 30. Orphaned fawn successfully reared on a bottle. The airedale dogs are good friends of the fawn. Photograph by Geo. C. Walker.

When Mr. Walker returned to his winter residence in Oakland about the last of September, he shipped the fawn down there, where it has attracted considerable public attention, especially because of its tameness.—Joseph H. Sanders.

FACTS OF CURRENT INTEREST.

The season's record albacore taken at Avalon, Catalina Island, November 13, 1917, weighed 54½ pounds and took 27 minutes to land on light tackle. The second largest albacore for the season weighed 41 pounds.

Fishermen in southern California have been on a strike, demanding $18 a ton for sardines, instead of $12 as formerly.

Ducks appear to be more numerous in the Sacramento Valley this year than for several years past.

On Thursday, November 1, 1917, fishermen at San Francisco secured the largest catch of flat fish (sandabs, sole) ever made at this port—2,000 boxes, or approximately 770 tons.

Crab fishermen of San Francisco report that crabs are unusually abundant and that they could easily exceed their contract, which calls for 600 dozen per day.

The deer season was a great success. There were apparently just as many, if not more, hunters in the field, despite the draft.

Quail have been abundant and hunters have reported good bags almost everywhere.

Schools of mackerel have been abundant along the Southern coast during the past few months, and pier anglers have enjoyed rare sport. Large net hauls have been made off the Long Wharf, Santa Monica.

The Long Beach Tuna Canning Company is planning to make a business of putting up whale meat.

The reported kill of deer in California during 1916 was 8,117. Altogether, probably not less than 12,000 deer were killed, furnishing somewhere near 450 tons of fresh meat.

Duck clubs in California have been "Hooverizing" by either stopping the baiting of ponds entirely, or by using screenings and other waste foods.

That good deer hunting is to be had in California is evidenced by the fact that, of a party of nine, hunting near Cloverdale, Sonoma County, on the opening day of the season, each obtained a buck.

FAIR PLAY.

(A page of criticisms and answers.)

MISDIRECTED PURPOSES OF GAME CONSERVATION.

Editor The Chronicle—SIR: I have been reading with a great deal of interest certain editorials appearing in the several daily papers relative to the action of the California Fish and Game Commission and the operation of the laws governing them in the discharging of their duties. I have been an ardent sportsman in the past and still hold a marked interest in both fishing and hunting. I commend the intention of the laws that are for the preservation of both fish and game. However, in the last few years things have come to such a pass that the liberty of the individual has materially lessened until the favored few derive all the benefits from the present laws. Most of my fishing and hunting have been done in the mountain counties of Siskiyou, Trinity and Shasta, particularly in Siskiyou, and I believe I know the needs and desires of the people in the last named county pertaining to fish and game. In this article I wish to bring before the public the conditions under which the law operates and the injustice of its operation. Until the last session of the legislature the open season for trout with hook and line was from May 1 until December 31. Satisfactory to all the fair-minded fishermen. Without the consent or wishes of the people, the law was changed to April 1 to November 1. By that method they have deprived the fishermen of two months' fishing. The steelhead trout does not begin to run in any numbers in the Shasta River until November 1, and this year the run was almost absent on account of the low water and lack of rain. The big run does not come until after the first big rain. Shasta River has always been a wonderful stream for steelhead during the months of November and December, and many people and especially the poor people use this particular fish for food, depending in part upon it for their food supply during the winter months. This year they are deprived by law and the activities of the Fish and Game Commission from securing even a portion of their usual supply. None of these fish are used for commercial purposes. No one makes a business of shipping or selling, and none is wasted. It seems to the majority of the fishermen and the people in general a very unjust discrimination, particularly when they allow fishing with hook and line in all the coast streams. During a time as at the present when food conservation is such a vital issue, it seems as though some means might be obtained to correct this state of affairs whereby those desiring to take fish for personal use would be allowed to do so to a limited degree during the present season when they could be taken at their best. These fish begin to spawn in the early spring and when the legal time for taking them is at hand they are of no value as food. I brought this matter up with one of the members of the commission a day or two ago, but was informed that the law would be enforced to the letter and all persons caught with trout in their possession would be severely dealt with. It will be a favor to the people in this particular district if you will publish this letter, showing the attitude of the Fish and Game Commission. Some method should be devised to correct such an unfair and unpopular law. N. A. HAWKINS.

Yreka, November 12, 1917.

—*S. F. Chronicle*, Nov. 27, 1917.

AN ANSWER.

November 23, 1917.

MR. N. A. HAWKINS, Yreka, Cal.

DEAR NORT: After our friendly chat several days ago regarding fishing conditions in Shasta and Siskiyou counties, I was very much surprised and rather hurt to read in the San Francisco *Chronicle* your letter criticising the work of the commission, and making statements regarding the fishing laws, which, coming from you, were a great surprise to me.

Before writing such an article you should have looked up not only the present laws, but the past.

First: You claim that the favored few derive all the benefits from the present laws. Such a statement is absurd. You have been an ardent fisherman for years

and you should know that it has been the desire of the Fish and Game Commission to suggest to legislators at Sacramento seasons to suit both the fly and bait fishermen.

Last winter, before the legislature met at Sacramento, several meetings were held, called by the commission, where suggestions were made by many sportsmen acquainted with conditions throughout the state, after which the commission prepared a bill and same was passed.

Mr. Henry Ream, your very able representative in Sacramento, went over the bill with me personally, and was more than satisfied, claiming that the people in his district wanted the season opened April 1 instead of May 1 as formerly, and that they did not care for November fishing, as it was very seldom the weather conditions would allow fishing during that month.

You personally know that it is very seldom that the Shasta River is in condition to fish with a rod during the month of November. You, in our conversation a few days ago, stated that you personally had always put up your rod in October. I know it to be a fact, as well as you, that fishing done in November or December in the Shasta River, or any other river in the northern part of the state, is not with a rod, but what fish are caught are caught with a spear or gaff.

Second: To show how unfamiliar you are with the laws governing fishing now, or in the past, you put yourself on record by stating that prior to the last session of the legislature, the season opened May 1 and closed December 31, and that this was satisfactory to all fair-minded fishermen. You are mistaken when you state the season ran to December 31. The trout season in California has never run later than November 30.

You also stated that the fishermen have been deprived of two months' fishing. During the year of 1916 and this year we had seven months' fishing, viz, from May 1 to November 30. This year the law has been changed and the 1918 season will open April 1 and close November 1. Where you can claim that the season has been cut two months I would like to know. You claim this was all done without the consent or wishes of the people.

Third: You state that the Shasta River has always been a wonderful stream for steelhead during November and December. I am well aware of this; but you certainly know, having fished the stream for years, that the stream is not fit for the rod during these months. This year on account of the lack of rain a few fish may be caught.

In the past you have always, when I met you, suggested that I should not fail to come up and visit you at Yreka and have some of your fine September steelhead fishing.

The real basis of your complaint is our enforcement of the law, rather than the law itself. Trout (steelhead), both under the present law and the former one, may only be taken with hook and line. Salmon, however, may be taken with spear, and you must know that the native along the Shasta River takes his fish in fall with the spear. In past years all fish that came to the spear were salmon, according to him. Now, that there is a deputy who enforces the law, the law is wrong.

It is all very well to bring up the excuse of the high cost of living now; but we know, and I am certain that you do, that for years these people have been in the habit of catching steelhead in the closed season and salting them down.

I will quote you the law on this subject:

> "Every person who takes, catches, kills or has in his possession during one calendar day more than fifty trout, or ten pounds of trout and one trout, or one trout weighing ten pounds and over, is guilty of a misdemeanor."

You will find in all districts a certain class who wish the laws made to suit their own convenience, and when they can not have their own way immediately start in to criticise the Fish and Game Commission.

I believe that you will find that it is our duty to see that the fish and game laws are obeyed. We do not make the laws, but at times are requested to make suggestions regarding changes, etc., and whenever we do so, believe me, it is always for the conservation of the fish and game.

Fig. 31. The growth of antlers of a deer. This splendid series of photographs was secured by Superintendent William Dirks of the State Game Farm. d, May 3, 1917; e, June 6, 1917; f, July 6, 1917; a, August 6, 1917; b, Sept. 1, 1917; [illegible] Sept. 10, 1917

You say in your letter you "commend the intention of the laws that are for the preservation of both fish and game." If so, would it not be well for you to assist us in our work by talking to the people in your district where, you know for years, both fish and venison have been salted down in large quantities; and do not rush into print condemning us for something that you have shown plainly you are not familiar with.

Knowing you as I do, I feel it my duty to call your attention to many misstatements in your letter published in the *Chronicle*. The public is often misled in this way and the Fish and Game Commission is unduly criticised.

Yours truly,

(Signed) E. L. Bosqui.

HATCHERY NOTES.

W. H. Shebley, Editor.

TROUT AND SALMON DISTRIBUTION FOR 1917.

On November 6, Fish Distribution Car 61 completed the distribution of the last consignment of fish from Mount Shasta Hatchery for the season of 1917, when the streams of Marin and Sonoma counties received their annual allotments of trout fry.

The season past has been one of the most successful in the history of the California Fish and Game Commission. As shown by the following table, a total of 26,386,000 trout and salmon fry were distributed. This included a shipment of 100,000 steelhead trout eggs, which were shipped from the Brookdale Hatchery to the Minnesota Game and Fish Department to be hatched and distributed in the streams of that state. This consignment of eggs was shipped in exchange for a consignment of German brown trout eggs received from the Minnesota Commission during the season of 1916.

Trout and Salmon Distributed in 1917.

Mt. Shasta—	
Rainbow	3,073,500
Eastern brook	1,613,500
Loch Leven	1,500,000
Black-spotted	987,000
Steelhead	3,000,000
Total trout	10,174,000
Salmon	6,862,000
Mt. Whitney—	
Rainbow	300,000
Black-spotted	250,000
Steelhead	700,000
Total trout	1,250,000
Tahoe—	
Rainbow	241,000
Black-spotted	763,000
Total trout	1,004,000
Tallac—	
Black-spotted	1,946,000
Fort Seward—	
Rainbow	140,000
Steelhead	1,322,000
Total trout	1,462,000
Salmon	491,000
Almanor—	
Rainbow	355,000
Domingo Springs—	
Rainbow	126,000

Brookdale—	
Steelhead	[illegible]
Ukiah—	
Steelhead	415,000
Snow Mountain—	
Steelhead	202,000
Bear Lake—	
Rainbow	874,000
Wawona—	
Rainbow	147,000
Steelhead	68,000
Total trout	215,000
Total trout	19,022,000
Total salmon	7,364,000
Grand total	26,386,000

Immediately upon the completion of the distribution of fish from the different hatcheries, preparations were commenced for the coming season's operations.

The usual work of repairing and painting the hatching troughs and buildings at the Mount Shasta Hatchery is well under way, and the ponds and grounds have received their annual overhauling.

Eastern brook and Loch Leven egg collecting operations were commenced during the latter part of October, and to date 1,271,000 Eastern brook and 1,748,000 Loch Leven eggs have been taken.

Arrangements are being made to ship 75,000 Loch Leven trout eggs to the new Mount Whitney Hatchery in Inyo County from Mount Shasta Hatchery as soon as they can be safely packed and shipped. The Loch Leven eggs, together with 100,000 of the Eastern brook trout eggs, which have been ordered from one of the Eastern hatcheries, will be hatched at the Mount Whitney Hatchery and distributed in the streams of southern California.

Following the plans for bringing up the fishing to the trout rearing capacity of Bear Lake, a crew of experts has been busy taking advantage of the fine fall weather to install 30 troughs, together with the necessary flumes, fishways, live cars, covering frames, etc., as well as constructing a temporary tent house to shelter them while the negotiations for the necessary long-term lease with the North Estate are being concluded, when a permanent structure will be built.

The Bear Lake Egg Collecting Station on North Creek will have a capacity of 6,000,000 eggs. The lake is now six feet lower than last year. A normal rainfall will raise it four feet, in which event the sexually mature trout will again come to North Creek to spawn; but should the

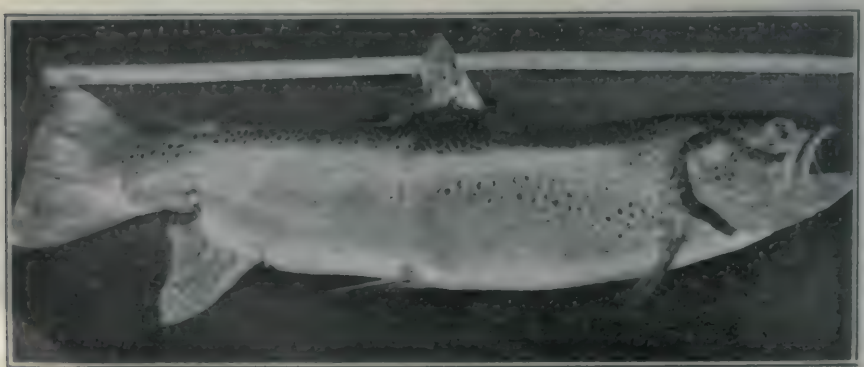

Fig. 32. A seven and one-half pound Lock Leven trout caught by Mr. A. Lunde in September, 1917, in Big Bear Lake, San Bernardino Mountains. Photograph by W. M. Pierce.

winter be dry and lake levels remain low, the spawners will scatter to the mouths of the other creeks and deposit their eggs, decreasing greatly the egg-taking opportunities of the "strippers" at North Creek. All preliminary arrangements have been completed at this station, and everything is now in readiness for the commencement of egg collecting operations as early in the spring as it is possible for the crew to get in through the desert pass.

Tahoe Hatchery has been shut down for the winter, and a ten years' lease has been secured from Mrs. Anita Baldwin on Tallac Hatchery, which is unique as the only available place for collecting and hatching the eggs of the black-spotted trout.

The Commission is also negotiating for the purchase of three acres of the Frank X. Walker property, near Tahoe City, which includes three natural springs. It is planned to abandon the old Tahoe City Hatchery, and erect a modern hatchery with a capacity of three to four million trout.

Plans to improve Wawona Hatchery are pending. We are waiting for a lease from the Wawona Hotel Company, who have promised us all that we have requested in the shape of land and water rights.

Almanor and Domingo Springs hatcheries were closed during the latter part of September, after being put in readiness for the spring egg collecting operations, which will probably be commenced during the fore part of March.

Salmon egg collecting operations at Bryans Rest on Eel River, Humboldt County, have not proved a success. After a two-foot rise in the river, a few salmon reached the racks, and 350,000 eggs were taken. The opinion of our assistants in charge of the operations is that the market fishermen were catching nearly all of the fish in the lower reaches of the river. The racks, traps, etc., were carried out by the flood waters following the last storm, but fortunately practically all of the material was saved, and can be used for future operations.

The Fort Seward Hatchery has been given a thorough overhauling and is in excellent condition for next season's operations. The salmon eggs taken at the Bryans Rest Station will be hatched and reared at Fort Seward Hatchery, and distributed at the proper time in the tributaries of Eel River.

Ukiah Hatchery and Snow Mountain Egg Collecting Station will be repaired during the month of December. The fishway and trap on the Snow Mountain Dam were damaged by the water last season, and must be repaired before the steelhead trout begin to run.

A few minor repairs are necessary at the Brookdale Hatchery, and this work will be completed during the month of December.

Scott Creek Egg Collecting Station is in readiness for the season's operations.

A HATCHERY FOR YOSEMITE VALLEY.

If negotiations now pending with the Department of the Interior relative to a water supply and site are successful, it is proposed to erect a suitable hatchery in the Yosemite Valley this coming season. The ever-increasing number of visitors and pleasure seekers to this wonderful section, and its easy access by automobile, has made it necessary to heavily stock the streams and lakes of this region. The long distance that the fish have to be carried from Mount Shasta or the Mount Whitney hatcheries to the Yosemite region does not meet the demand, as the number that can be shipped so great a distance is limited. It will be a better policy and more economical to hatch and rear the fish in the Yosemite Valley, where they can be distributed by the park service. In addition, a hatchery in the Yosemite would be of great educational value as it would be visited by most of the 30,000 persons who visit the valley annually.

INSECT FOOD FOR TROUT INTRODUCED.

A most important work has been undertaken by the Fishcultural Department in the collecting and distributing of aquatic insects upon which trout feed. Caddisfly larvae being taken from the Klamath River to streams tributary to Lake Tahoe, and 300,000 of the valuable *Gammarus*, or fresh water shrimp, being brought from the state of Nevada to plant in Tahoe and Donner lakes. The planting of suitable food should keep pace with the distribution of young fish.

carrying this idea even to the introduction of aquatic plants upon which such insect life can multiply. Many Sierra lakes, otherwise ideal, are barren of fish because they produce no feed, and must first be built up to support fish life, after which trout can be established in a very short time. It is the plan of the Department of Fishculture to begin systematic operations, on a large scale, to introduce aquatic plants and insects in the barren waters of the more important lakes in the high Sierras during the coming season. This work must be done by persons familiar with the habits of the insects and fish as well as the conditions that prevail in the lakes that are to be stocked. As soon as the insects are introduced and are thriving, the lakes will be stocked with trout fry.

SUCCESSFUL INTRODUCTION OF SALMON IN NEW ZEALAND.

The Fishcultural Department has received a letter from the Honorable L. F. Ayson, Chief Inspector of Fisheries for New Zealand, that will be of interest to all fishculturists interested in the propagation of salmon. It also puts some new light on the "parent stream theory" regarding the habits of the salmon. Evidently the salmon have not confined themselves to the stream in which they were planted in New Zealand. The efforts of the New Zealand Government to establish a run of salmon in New Zealand began in 1873, when the first salmon eggs were shipped from California to New Zealand. At different times from 1873 to 1900, shipments of salmon eggs were made to New Zealand, but no results were obtained. In 1900, G. H. Lambson, then Superintendent of Baird Hatchery on the McCloud River, took a consignment of salmon eggs from McCloud River, California, at the request of Honorable L. F. Ayson, Inspector of Fisheries, to New Zealand. Mr. Lambson personally attended to the collection and preparation of these eggs, and cared for them en route, and on their arrival in New Zealand, arranged for the hatching and rearing of the fry. From this and subsequent lots taken by Mr. Lambson, dates the introduction of the quinnat salmon into waters of New Zealand. Following is an extract from the letter of Mr. Ayson regarding the salmon in New Zealand:

"W. H. SHERLEY,
Dept. of Fishculture,
San Francisco.

DEAR MR. SHERLEY: I was very pleased indeed to get your letter of the 7th February, and also the copy of your biennial report, which you kindly sent. The report contained a great amount of most interesting and useful information. There is no mistake about your fish culture work progressing and on modern lines.

With regard to the spread of salmon along our coasts, the Waitaki is the only river on the east coast of the South Island in which salmon have been planted, and now they have spread from there into five rivers north along the coast, for a distance of fully three hundred miles, and south from the Waitaki for a distance of about 120 miles. There is a strong ocean current running from south to north along that coast which no doubt accounts for the salmon traveling further north than they have done south.

The first river suitable for salmon is the Rangatata about ninety miles north of the Waitaki, and they made their appearance there five years after the first fish were taken in the spawning season, in a tributary of the Waitaki, and now nearly as many run into the river as into the Waitaki. In each of these rivers over three tons of salmon were caught by trout anglers in five weeks last autumn. In New Zealand, at any rate, salmon have of their own accord spread along the coast and ascended and spawned in rivers where no salmon have been planted.

In this country the trout fishing is controlled by Acclimatisation Societies, and as the salmon come in, in the autumn, when the run of trout is over, anglers have had splendid sport catching these fish with spinning bait after the trout fishing is finished. This has considerably increased the number of anglers, and the Societies' revenue from angling licenses, and they are now making a big bid to get the control of the salmon. This, of course, I am strongly opposed to for reasons—(a) that the State found all the money and did all the work of introducing these fish, (b) that the Societies at first opposed the introduction of this salmon because they said "it was no sport fish and not desirable fish to introduce," and (c) that the Societies' administration and fish cultural methods are wasteful, inefficient and not to the best interests of the majority of our people.

Yours very sincerely,
L. F. AYSON,
Chief Inspector of Fisheries."

COMMERCIAL FISHERY NOTES.

N. B. Scofield, Editor.

OUTPUT OF CALIFORNIA'S FISHERIES DOUBLED.

An appeal has gone out from the government, through the Food Administrator, urging that all kinds of food production be speeded up. It has been especially desired that the production of the fisheries be increased in order that the more concentrated meats may be released for shipment to Europe. No other state has responded as has California. The catch of fish during the year just passed is double that of the previous year. The large take of sardines and herring during the closing months of the year is certain to send the year's catch above the two hundred million pound mark. This increase has been accomplished without suspending fishing regulations and restrictions. In most of our seacoast states there has been a decreased catch of fish during the last year, which in some cases was due to the use of the larger fishing vessels for other purposes, while in other cases it was due to impoverishment of the fish supply. This impoverishment is most striking in the case of halibut and salmon along our north Pacific Coast and Alaska as well as British Columbia. The companies operating in this region are not asking that all fishing restrictions be removed for they have at last awakened to the fact that the halibut and salmon supply is not inexhaustible and that the present restrictions are inadequate to safeguard the future and keep these fisheries up to their full capacity. After years of indifference as to the future, they are now "demanding" conservation.

Although the fisheries of California have done so well in the present crisis, we should be able to increase their production very greatly during this coming year. We should not lose sight of the fact that nearly all of our fishery products are used outside of the state and that a large part is even sent outside of the United States.

The people of the Nation are being urged by the Food Administrator to use foods that are near at hand in order to relieve our congested railroads. It is a patriotic duty, therefore, for the people of this state to use more of our fish which are here in such quantities close at hand.

Such a small quantity of fish is used locally by the people that the fresh fish dealers are unable to sell at a low price. Experience has taught these dealers that reducing the price does not result in a corresponding increase in consumption and that their business can be made to pay only by charging a relatively high price. With the great expense that is required to furnish a small amount of fish on but one day a week, it is a wonder that the price is as low as it is. The butchers are complaining that the meatless Tuesday so increases their overhead expense that their business is not profitable and that they will have to raise prices. Fresh fish dealers have been struggling along with six fishless days a week. If people would use fish on each day of the week as they do meats, fish stalls would increase in number, competition would develop, marketing and transportation conditions would improve and fish would become our cheapest article of food.

THE SALMON CATCH ON EEL RIVER.

The Eel River salmon season opened on October 8 with several companies competing for the fish and nearly 150 boats with gill nets fishing in the lower five miles of the river. The first night's catch was nearly 200,000 pounds, and then for several days very few were caught. The stream is usually low at this season and the salmon congregate in the pools in the lower river for two or three weeks before the opening of the season. As it has been claimed that a great many steelhead are taken at the first of the season, a sharp lookout was kept for these fish, but only seven were taken the first night. The season closed on December 7 with a rather poor season's catch. The river remained very low until just before the close when a rain brought a four foot rise. It came too late, however, to start the fish before the closing day. That the diminished catch was due to late runs and not to a depleted fish supply, is borne out by the fact that the silverside

salmon which usually appear by the first of November and reach their height about December 1, did not put in their appearance until a few days before the end of November. Steelhead were also late and less than 10,000 pounds were taken which is about one-third of the amount taken last year. The fishermen are endeavoring to get the river opened again during the month of January, arguing that the river can furnish 100,000 pounds of steelhead during that month without injury to the steelhead supply. Fishermen on Smith River, Del Norte County, claim the same for that river.

SEA FOOD WASTED.

Recently nine hundred pounds of fish were sent from San Diego, California, to El Paso, Texas, to be used by the people of that city on Friday, the day which has been inherited as fish day. The shipment arrived too late for Friday's market and as the next Friday was too far off, the lot went to the city disposal plant after waiting three days for buyers who were willing to take a chance at them on a day other than Friday. The El Pasons did not see the humor of it, but berated the express companies for causing a waste of food in these war times.

NO FIXED PRICE ON SALMON.

At the request of the State Market Director, the fishermen, dealers, canners and others interested in salmon, met at his office on December 6 to discuss the matter of fixing the price of fresh salmon this winter. Detailed figures were presented by the Monterey Bay and Sacramento River fishermen, which showed that at any price the market is likely to pay, the fishermen will not make expenses during the winter or off season, which extends from November to April. Under the circumstances, the Market Director determined it would be unjust to fix the price at this time.

KELP HARVEST FOR 1917.

The amount of kelp harvested on the coast of California during 1917 was 398,898 tons. From this kelp was produced 6,000 tons of potash (K_2O) with a value of $2,100,000.00. Other products are being produced from the kelp, such as acetone, several esters, chetones, sodium alginate, and potassium iodide.

LIFE HISTORY NOTES.

DUCKS DIE AT SALTON SEA.

From about August 15 to the last of October, 1917, large numbers of ducks and other water birds died at Salton Sea, in the Imperial Valley. In the early part of October pintail ducks died by the hundreds and formed a windrow along the shore. I counted forty dead bluebills and fifteen canvasbacks in a distance of fifty rods along the shore of the lake on October 14. The birds lose the use of their legs and then of their wings, and finally are absolutely helpless. After developing these symptoms they are certain to die in from one to four days.

Although cormorants and white pelicans are numerous, they do not appear to be subject to the disease. Geese also, though abundant, do not seem to be affected.

Several persons have eaten the meat of the diseased ducks with no ill effects, and cats feeding upon the dead birds show no symptoms of poisoning.

All evidence points to the view that this is the same sort of disease that has appeared at Tulare and Buena Vista lakes in California and at Great Salt Lake in Utah.

Apparently ducks affected with the disease are benefited with a change to fresh water. My man and I have picked up a great number of birds so affected and have placed them on sandbars at the mouth of the river. Here they appear to do better, but most died or were eaten by coyotes, which are plentiful here.—CHARLES E. DAVIS.

CANADA GEESE BRED IN ALAMEDA COUNTY.

Six or seven years ago I bought six Canada geese (*Branta canadensis canadensis*) at Hawthorne, Esmeraldo

Fig. 33. Shore of Salton Sea showing numerous ducks which have died from a peculiar disease. Each of the black spots in the photograph represents a dead duck. Photograph by J. K. Heath.

County, Nevada. They were caught in Walker Lake with a net, during the molting season, and were placed inside a wire enclosure at my place near Alvarado, Alameda County, California, along with some black swans. The swans immediately attacked the geese, killed one of them and injured another so that it died soon afterwards. Of the four geese that were left, one was a female and the other three males. About a year ago last August the female escaped by rising on a high wind, but returned to me two or three months later, joining the other three geese.

The enclosure in which they are kept has a little artificial lake about 150 feet in diameter, with an island in the center about fifteen feet in diameter. Last Spring (1917) my caretaker observed the female trying to make a nest on this little island. He accordingly gathered some grass, weeds, etc., and placed them on the island, with the result that the geese laid six eggs, five of which hatched, and four of the goslings are now fully grown, making eight geese altogether.

This appears to be the first instance of wild Canada geese being bred at lower elevations.—F. M. Smith.

WHITE DEER IN TRINITY COUNTY.

Hardly a season passes that a white or cream-colored deer is not reported as having been seen in Trinity County. Nor are these reports unfounded, for there are many well authenticated instances and several skins are in existence. The Indians of the Hoopa Reservation have long utilized white deer skins in one of their religious ceremonies and at least one skin procured in late years has become the property of an Indian on the reservation. I saw a white deer many years ago on the upper Hayfork River. This animal was later shot by the Shock Brothers of Hayfork, who report that they have killed two other white deer. Albinos have been seen by eight different people whose names I have in my possession. A few years ago George Grieg of Junction City killed a white spiked buck. He was arrested, fined twenty five dollars and the confiscated skin was sent to the Fish and Game Commission. The most recent report of a white deer is of one seen by Henry Morris and Charles Knowles in May, 1917, on Redding Creek, near Junction City.

In my opinion white deer should be protected by law, because of their rarity and unusual interest. Owing to the greater value of the skin, there is increased incentive to kill such animals and consequently danger of exterminating them.—G. O. Laws.

REPORTS.

CALIFORNIA FISHERY PRODUCTS FOR THREE MONTHS ENDING SEPTEMBER 30, 1917.

Species of fish	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Solano, Yolo	Sacramento, San Joaquin	Alameda, Contra Costa	San Francisco	Santa Cruz	Monterey	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego	Imperial	Total
Albacore										482	6,981,452	100	4,901,529		$ 11,883,563
Anchovy							87,525		97,795		31,798				719,679
Barracuda									5,657	37,307	304,795	12,718	189,526		595,654
Bonito								2,197		4,448	102,798		15,366		124,879
Bocaccio		100				50	4,928	12,925	58,797						76,810
Bluefish							145,361	2,945	6,214						154,520
Chilipepper							128,710	50,480	8,092						187,282
Carp				928	6,610	4,845	15,888		8		15,867				44,758
Catfish		50		1,420	2,797	4,044	994								9,305
Codfish		462					205,201	25,418	980		992				232,893
Cultus cod	927	30,476	125			420	141,698	9,485	12,513		42				195,235
Dogfish		3,150	6,465			50	5,598				7,897		8,402		31,960
Flounder	413					75	222,457	7,708	120						230,865
Halibut	14,985	81,865					11,096	3,108	21,216	24,963	47,917	11,908	274,744		390,932
Hake							28,284	10,555		275	8,895		295		48,714
Herring										570	780				1,780
Kingfish							51,814	7,541	49,975	908	25,041		2,606		137,885
Mackerel								66	205,764	10,181	712,106	5,718	74,078		1,007,913
Mullet														8,046	8,046
Pike				4	195	335	1,908								11,438
Pompano							15	530	54	68	2,131		211		3,009
Perch	3,842		1,278			8	58,856	1,975		975	1,461				67,115
Rock bass	3,750									478	81,879	5,278	56,697		148,082
Rockfish		1,896	202			50	271,522	244,099	211,418	10,[illegible]	[illegible]974	584	139,976		1,[illegible]7
Sole		94				187	1,915,910	1,115,779	9,864	14,503	241				3,052,398
Salmon	741,257	367,229	89,702	1,878,454	741,645	982,495	1,715,442	16,658	459,718		1,510				6,[illegible]5,710
Smelt	2,614		12,457			257	98,294	55,89[illegible]	78,645	11,240	14,092	17,884	2,029		[illegible],354
Sea bass (white)			5,974			263	854	878	3,655	2,405	167,985	2,591	176,598		299,456

Sea bass (Black)													
Surfperch													
Striped bass													
Steelhead													
Sturgeon													
Sucker													
Sharks							61,631			83			
Sculpin							150						
Sea trout										197			
Tom cod							4,452			56			
Trout (other)										79			79
Trout (steelhead)	1,580					72							1,347
Tuna		75	430						28				433
Whitefish			125				95,482						89,607
Miscellaneous		10,451		100	120	60	90,913	875		10,477		6,250	108,578
Total fish													
Crustaceans—													
Crab (dorm)	54,054						14,540	5,250					26,490
Spiny lobster										1,200	20,774	4,500	71,464
Shrimp							100,000						278,700
Total													69,085
Molluscs—													
Squid									111,750				111,750
Cuttlefish			50				2,205	2,419	1,502				7,474
Clam (Pismo)									13,440	1,056			14,496
Clam (soft)		24	2,250							2,700			5,000
Clam (others)		400				3,000	35,000						38,000
Clam (unspec.)	75,840	50	50,400			4,200	35,000	500		2,250			87,400
Oyster (native)							1,200						1,200
Oyster (eastern)			40				600,000						600,040
Abalone		6,000							65,000	1,140			72,000
Mussels	1,000	2,000				200	10,000		200		600		13,000
Total													1,170,110

VIOLATIONS OF FISH AND GAME LAWS.

June 1 to October 31, 1917, Inclusive.

Offense	Number	Fines
Game.		
Hunting without license	71	$1,127 00
Failure to produce license on demand	2	
Deer, close season, killing or possession spike-buck	4	1[illegible] 00
Deer horns and skins—failure to produce	8	17[illegible] 00
Female deer and fawns—killing or possession	16	6[illegible] 00
Illegal deer hides	4	14[illegible] 00
Deer not properly tagged (close districts)	2	2[illegible] 00
Quail, close season, killing or possession	16	2[illegible] 00
Ducks, close season, killing or possession	55	1[illegible] 00
Doves, close season, killing or possession	17	3[illegible] 00
Cottontails, close season, killing or possession	16	3[illegible] 00
Brush rabbits, close season, killing or possession	3	[illegible] 00
Nongame birds, close season, killing or possession	2	2[illegible] 00
Fur-bearing mammals, close season, killing or possession	3	2[illegible] 00
Shore-birds, close season, killing or possession	14	12[illegible] 00
Sage-hens, close season, killing or possession	1	[illegible] 00
Cranes, close season, killing or possession	1	2[illegible] 00
Grouse, close season, killing or possession	1	5 00
Night shooting, close season, killing or possession	11	17[illegible] 00
Total game violations	287	$6,[illegible] 00
Fish.		
Angling without license	23	$420 00
Fake statement on application	3	[illegible] 00
Fishing for profit without license	13	2[illegible] 00
Trout, close season taking or possession	1	5 00
Trout, sale undersized	1	2[illegible] 00
Trout, taking other than with hook and line	6	17[illegible] 00
Trout, excess bag limit	3	5[illegible] 00
Catfish, offering for sale undersized	2	1[illegible] 00
Barracuda, offering for sale underweight	1	20 00
Spot-fin croaker, offering for sale, close season	1	5 00
Sacramento perch, excess limit	1	10[illegible] 00
Black bass, close season, possession undersized	3	7[illegible] 00
Striped bass, close season, sale, possession, underweight	9	4[illegible] 00
Salmon, close season, taking or possession	6	2[illegible] 00
Crabs, close season, taking or possession	7	2[illegible] 00
Crabs, female, undersized		
Abalones, close season, taking or possession, undersized	6	9[illegible] 00
Clams, undersized, excess bag limit	14	2[illegible] 50
Dried California shrimp in possession	3	1[illegible] 00
Dynamiting fish	2	2[illegible] 00
Illegal nets	8	5[illegible] 00
Fishing within two-mile limit	1	
Total fish violations	114	$2,[illegible] 50
Grand total fish and game violations	401	$9,[illegible] 50

SEIZURES—FISH, GAME AND ILLEGALLY USED FISHING APPARATUS

June 1 to October 31, 1917, Inclusive.

Game.

Ducks	862	
Quail	32	
Doves	99	
Geese	9	
Cottontails	18	
Brush rabbits	19	
Grouse	2	
Sage hen	3	
Coots	1	
Snipe birds	71	
Deer meat	934½	pounds
Deer heads	4	
Bear rodes	1	

Fish.

Trout	477½	pounds
Salmon	4,045	pounds
Striped bass	588½	pounds
Barracuda	2,200	pounds
Sturgeon	115	pounds
Spotfin croakers	1,726	pounds
Catfish	264	pounds
Crabs	1,385	
Abalones	46	
Clams	1,385	
Clams	137½	pounds
Lobsters	125	pounds
Bread shrimp	6,500	pounds
Nets, traps and fishing outfits	11	

Searches.

Illegal fish and game	25

STATEMENT OF EXPENDITURES FOR THE MONTHS OF MAY, JUNE, JULY, AUGUST AND SEPTEMBER, 1917.

	May	June	July	August	September
General Administration.					
General administration	$3,[illegible] 47	$2,[illegible] 40	$2,[illegible] 04	$2,[illegible] 47	$2,[illegible] 43
Research publicity and educational [illegible]	198 75	[illegible] 40	[illegible] 87	[illegible] 55	264 [illegible]
Printing	118 [illegible]		282 94	429 [illegible]	[illegible]
Fish exhibits	4 [illegible]				324 [illegible]
Game exhibits					74 [illegible]
Game farm	871 [illegible]	385 [illegible]	388 [illegible]	400 [illegible]	405 [illegible]
Mounting fish [illegible]	185 [illegible]	220 [illegible]	750 [illegible]	70 [illegible]	49 [illegible]
Lithographing [illegible]		840 [illegible]			
Lithographing game [illegible]					
Heating Terminal [illegible]	254 70	1,401 [illegible]	1,350 [illegible]	1,[illegible] [illegible]	1,[illegible] [illegible]
Angler [illegible]	1,[illegible] 00	402 [illegible]	2,[illegible] 70	1,[illegible] [illegible]	1,[illegible] [illegible]
Market fish [illegible]	324 50	304 [illegible]	34 [illegible]	62 [illegible]	32 [illegible]
Paint Mill Creek Dam					
Totals	$[illegible] 43	$5,[illegible] 47	$5,[illegible] 41	$4,[illegible] 75	$[illegible] 35
Patrol.					
San Francisco district	$1,[illegible] 94	$1,[illegible] [illegible]	$1,[illegible] 03	$1,[illegible] [illegible]	$1,[illegible] 01
Sacramento district	[illegible] 59	[illegible] [illegible]	[illegible] 12	[illegible] [illegible]	[illegible] [illegible]
Los Angeles district	[illegible] 90	[illegible] 71	[illegible] 51	[illegible] [illegible]	[illegible] [illegible]
Launch patrol	401 84	141 [illegible]	701 63	1,[illegible] [illegible]	[illegible] [illegible]
Prosecutions (fish and game)	30 00	20 00	70 00	[illegible] [illegible]	370 [illegible]
Crawfish inspection	80 00	[illegible] [illegible]	100 00	[illegible] [illegible]	120 [illegible]
Water game [illegible]	1 10				
Accident and death claims	150 05	101 [illegible]	200 64	[illegible] [illegible]	[illegible] [illegible]
Totals	$[illegible] 42	$[illegible] 72	$[illegible] 53	$[illegible] [illegible]	$[illegible] [illegible]
Department of Fish Culture.					
Hatchery administration	[illegible] [illegible]	$720 [illegible]	$[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]
Mt. Shasta Hatchery	1,[illegible] [illegible]	2,[illegible] [illegible]	1,[illegible] [illegible]	1,[illegible] [illegible]	1,[illegible] [illegible]
Klamath Station	[illegible] [illegible]	250 [illegible]			[illegible] [illegible]
Mt. Whitney Hatchery	[illegible] [illegible]	1,[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]
Rio Lobo Station		30 [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]
Cottonwood Station				[illegible] [illegible]	[illegible] [illegible]
Yuba Hatchery	[illegible] 13	382 [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]
Tallac Hatchery				[illegible] [illegible]	[illegible] [illegible]
Marlett Carson Hatchery					
Port Seward	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]
Ukiah Hatchery	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]
Snow Mountain Station	[illegible] [illegible]	[illegible] [illegible]			[illegible] [illegible]
Brookdale Hatchery	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]
Scott Creek Station	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]
Almanor Station	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]
Domingo Springs				[illegible] [illegible]	[illegible] [illegible]
Bear Lake Hatchery	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]
Wawona Hatchery	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	
Yuba City Station		[illegible] [illegible]			
Fish distribution	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]
Fish transplanting	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]		
Screen fishway and water pollution	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]
[illegible]					
Totals	$[illegible] [illegible]	$[illegible] [illegible]	$[illegible] [illegible]	$[illegible] [illegible]	$[illegible] [illegible]
Commercial Fisheries Department.					
Fishery research and patrol	$[illegible] [illegible]	$[illegible] [illegible]	$[illegible] [illegible]	$[illegible] [illegible]	$[illegible] [illegible]
Department of Engineering.					
Mt. Whitney Hatchery	$[illegible] [illegible]				
Grand totals	$[illegible] [illegible]	$[illegible] [illegible]	$[illegible] [illegible]	$[illegible] [illegible]	$[illegible] [illegible]

CALIFORNIA FISH AND GAME

"CONSERVATION OF WILD LIFE THROUGH EDUCATION"

Volume 4 SACRAMENTO, APRIL, 1918 Number 2

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Fig. 41. The herring (*Clupea pallasii*). One of the most abundant small food fishes found in our waters. Along with the sardine it is now becoming an important food fish.

THE HERRINGS AND HERRING-LIKE FISHES OF CALIFORNIA

By Edwin Chapin Starks, Stanford University.

This account includes the lady-fish, the herrings, the sardine, the shad and the anchovies. These fishes, though considered in three separate families are, nevertheless, rather closely related to each other. They are well separated as a group from other fishes, but mostly by internal characters that are of too technical a nature to be here included. They are rather closely related to the trout and trout-like fishes but lack the adipose dorsal fin.

Other groups of fishes contain more species than this group, but no other is represented by such a great number of individuals. They swim in immense schools in temperate and tropic regions. The world over they hold first place in commercial importance, though on our California coast this has only recently been true, for within a year or two the sardine has supplanted the salmon and tuna (albacore) in value.

The herrings and herring-like fishes are bright silvery, the head without scales, but the body covered with thin scales that are easily rubbed off. There is a single, short dorsal fin near the middle of the back. The ventral fins are back on the belly and not close under the pectoral fins as in the bass-like fishes. The fins are without spines and consist of soft rays only.

Considerable doubt seems to exist as to the relationship between the herring and sardine. The sardine is a herring but all herrings are not sardines. It belongs to the herring family (*Clupeida*) and hence may be correctly considered a herring.

GLOSSARY.

Anal fin. The single fin on the lower side toward the tail.

Caudal fin. The tail fin.

Dorsal fin. The single fin near the middle of the back.

Length of head. The distance from the tip of the snout to the hind edge of the gill cover.

Maxillary. The bone bordering the mouth above and extending backwards.

Opercle. The last bone of the side of the head covering the gills.

Pectoral fins. The paired fins just behind the head.

Ventral fins. The paired fins back on the abdomen.

In identifying any fish in this group it will be necessary to first find the family in the following key:

Families of California Herrings and Herring-like Fishes.

The body nearly as wide as it is deep. The snout pointed, cone-shaped, and projecting beyond a small mouth. The maxillary not reaching backwards behind the eye. *The Lady Fishes (Family Albulidæ): Page 60.*

The body deeper than wide. The snout not cone-shaped and not projecting beyond the mouth in front. The maxillary not extending backwards behind the eye. *The Herrings (Family Clupeidæ). Page 60.*

The mouth extremely large, with a pointed snout projecting beyond it. The maxillary reaching backwards behind the eye nearly to the gill opening. *The Anchovies (Family Engraulidæ). Page 63.*

THE LADY-FISHES.

(*Family Albulidæ.*)

The Lady-fish (Albula vulpes).

The body is nearly as wide as it is deep and the head is wedge-shaped with a pointed snout that overhangs the small mouth. The top of the head between the eyes is flat, and the sides are nearly vertical. The maxillary does not reach back to opposite the eye. The eye is nearly covered with a thickened, transparent membrane. This is a very brilliant silvery fish, dark olive-brown on the back and with faint streaks following the rows of scales. It reaches a length of 3 feet and is common in tropical seas. On our coast it is not very uncommon in San Diego Bay and has been taken as far north as Monterey Bay. In most localities it is little valued for food, though this is not always an indication of the real food value of a fish.

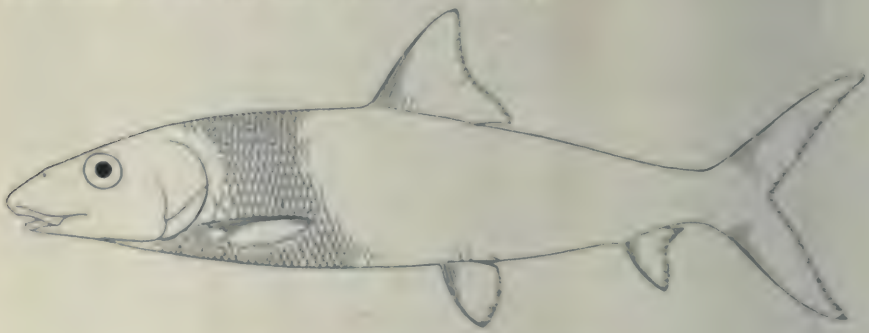

Fig. 35. The lady fish (*Albula vulpes*).

The young of this fish pass through a metamorphosis. They are for a time elongate, small-headed, band-shaped and composed of very loose, colorless, transparent tissue, so clear as to be scarcely seen when in the water. From this condition they become gradually shorter and more compact, shrinking from 3½ inches in length to 2 inches. Then commences their real growth and soon they assume the adult form. In the Gulf of California where the lady-fish abounds, these band-shaped young are often thrown on the beaches in great masses by the waves.

THE HERRINGS.

(*Family Clupeidæ.*)

The Japanese Herring (Etrumeus microps.)

This herring may be known from others of its family by the ventral fins being entirely behind the dorsal, rather than partly or entirely under it, and by the short base of the anal fin which is less in length than the diameter of the eye. The head is a little longer than the

depth of the body. The eye is covered with a transparent, thickened membrane. The color is bright silver with each scale on the back having a large brown spot.

This fish is more nearly round in section (cigar-shaped) than are other members of its family on our coast, the width of the body being about two-thirds of the depth. Next in order in this respect is the

Fig. 36. The Japanese herring (*Etrumeus microps*).

sardine, which is considerably plumper than the herring, and deepest of all is the shad, which is very much deeper than wide.

The Japanese herring is a common species in the Hawaiian Islands and in Japan. Specimens have been taken at San Diego, and a few years ago two specimens were sent to Stanford University from that locality with the statement that it was not rare in certain seasons. It should be looked for and its appearance and abundance reported to the State Fish and Game Commission.

The Sardine (Sardinia cærulea).

The sardine may be known by the operele having a few raised lines or ridges running obliquely downward, the head longer than the depth of the body, and the breast and belly not drawn to a sharp, saw-toothed edge. The ventral fins are under the base of the dorsal fin, and the base of the anal fin is twice or more times longer than the diameter of the eye. The maxillary reaches to below the middle of the eye. The

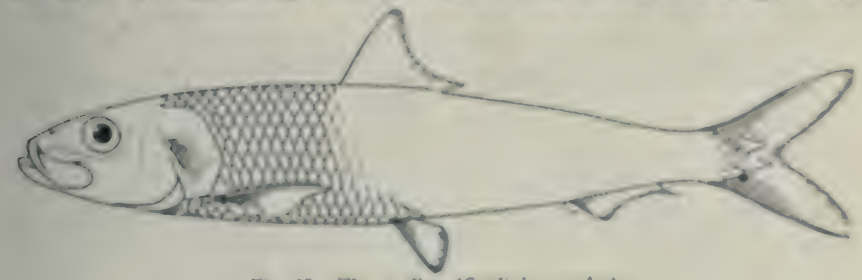

Fig. 37. The sardine (*Sardinia cærulea*).

color is bluish on the upper parts and bright silvery below with metallic reflections. A series of large dark spots is usually present along the side, but often they are absent, especially in large individuals.

The sardine occurs in great abundance along the entire west coast of the United States and southward on the coast of Lower California. It is taken the year around and is especially abundant from Septem

ber to December. It spawns in the spring. It is an oily, delicately-flavored fish that resembles very closely the European sardine (*Sardina pilchardus*). On the coast of South America is a sardine that is almost identical with it, but that differs sufficiently to regard it as a separate species. In Europe the small sized fishes only are canned, though the European species grows to be nearly as large as ours. On our coast fishes of all sizes are canned. As a pan fish it is particularly delicious.

The best canned sardines are carefully cleaned, soaked for a time in cold running sea water, surface dried in the sun or in a hot current of air, boiled in oil, packed in cans, again cooked in a retort, and then aged for several months, if preserved in oil, before they are marketed. A great difference exists, however, in our sardines, owing to quick, poor methods of canning. It may be added that the canned product is rapidly improving. The brands that were poor are being made better so that the difference between them will doubtless become less and less marked. Among our west coast sardines are some that are not surpassed by any in the world.

The Herring (Clupea pallasii).

The opercle has no raised ridges as in the sardine, and the head (in specimens over 5 or 6 inches in length) is about equal to the depth of the body. The ventral fins are under the base of the dorsal fin, and the breast and belly are not sharply saw-toothed. The color is silvery on the sides and lower parts and slate-blue above. The tip of the snout and lower jaw are dark.

The herring is widely distributed on both coasts of the Pacific and is found along our entire west coast southward to San Diego Bay, but it is not at all common on the southern California coast. The herring

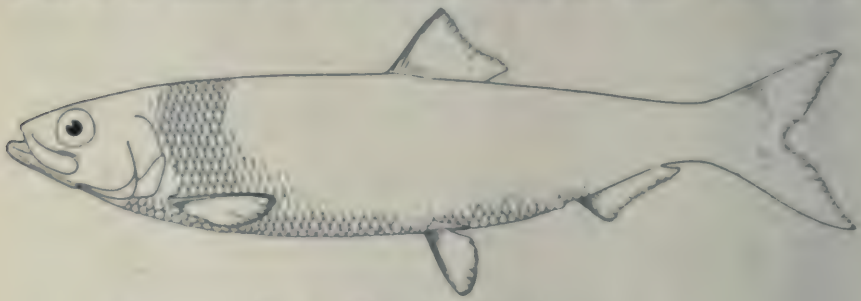

Fig. 38. The herring (*Clupea pallasii*).

fishery is scarcely developed, but considerable attention is now being paid to it and it may be expected to rapidly increase in importance. Some are smoked and cured in various ways, and many are salted for bait by the line fishermen. A part of the fishes that are cured and marketed as herring, however, are not this species, but are sardines. As a pan fish the herring is very good, but drier and not so richly flavored as the sardine, which makes it preferable to some people. It is only taken from December to April, when it enters the sheltered bays to spawn. Its whereabouts is not known for the balance of the year. The herring reaches a length of 18 inches.

The Shad (Alosa sapidissima).

The body is deep and is drawn to a sharp saw-toothed edge on the breast and belly. The opercle usually has raised ridges somewhat as in the sardine, but less even and regular in arrangement. The length of the head is much less than the depth of the body.

The shad does not naturally belong to our west coast fauna, it having been introduced from the Atlantic. It has become one of our abundant food fishes but it is not appreciated as it is on the Atlantic coast, even

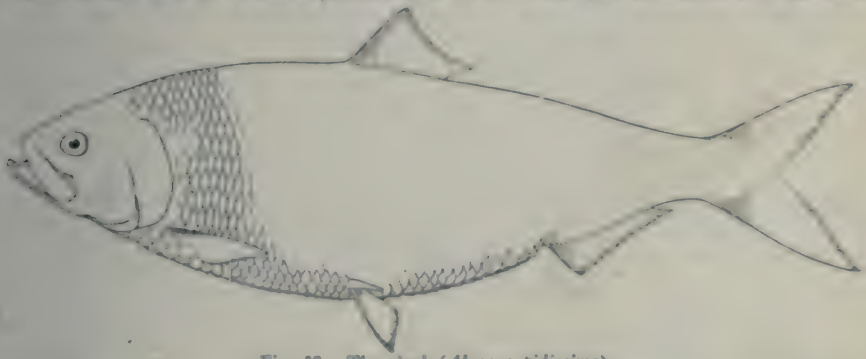

Fig. 39. The shad (*Alosa sapidissima*).

though the people there have a greater variety of good fishes to select from than we do. The shad baked or broiled is one of the most toothsome fishes that we have, and though it has a superabundance of small bones, its flavor more than pays for the trouble of removing them.

In the spring it ascends the streams to spawn and is then taken in abundance. In salt water it is not taken in any quantity, though occasional good-sized catches are made, especially in Monterey Bay. It is found in salt water as far southward as San Diego.

THE ANCHOVIES.

(*Family Engraulidæ.*)

The Northern Anchovy (Engraulis mordax).

The long head, slender body and short anal base separates this from the other two anchovies on our coast. The head is much longer than the depth of the body. The middle of the head is a considerable distance behind the eye. The anal fin base is much shorter than the head. In color it is bluish above and silvery on the sides and lower parts.

This is the largest and most valuable of our anchovies, growing to a length of 7 inches. It is found in great abundance along the entire west coast and is the only one found north of Santa Barbara. It is canned to some extent, but is inferior to the sardine, though inferior, perhaps, only because the proper methods of canning are not understood. As a pan fish it is exceedingly good when cooked until the bones are crisp, and it is difficult to imagine why it never appears in the fresh fish market. Its use in this form should be encouraged.

There is no reason why anchovies should not be pickled and packed, cooked in bottles as is done with its close relatives that we import from Europe. Nor is there any reason why it should not be made into a

Fig. 40. The southern anchovy (*Engraulis mordax*).

superior paste and even find a European market, where anchovy paste is used in great quantities. It is a very good fish salted, though in this form it is used as yet only as bait. It is one of our undeveloped resources that may become of importance.

The Southern Anchovy (Anchovialla delicatissimus).

This anchovy has the length of the head about equal to the depth of the body. The middle of the head comes at the hind edge of the eye. The length of the base of the anal fin is equal to the length of the head,

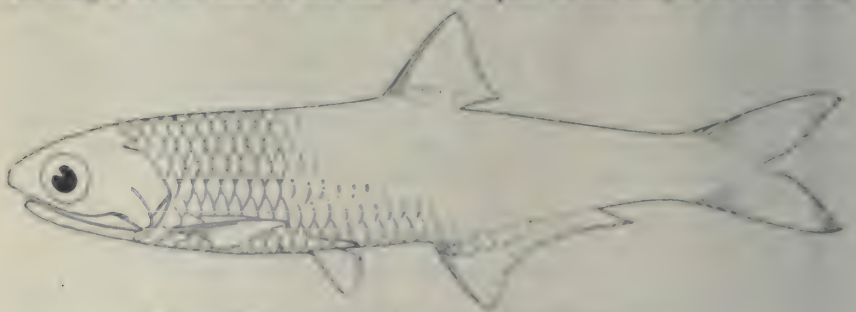

Fig. 41. The southern anchovy (*Anchovialla delicatissimus*).

or very slightly longer. The color is greenish and translucent; along the middle of the side is a silvery band.

This species is found very abundantly on the southern California coast. It does not much exceed 3 inches in length. Crisply fried in oil, this fish is all that its Latin name signifies—most delicate.

The Deep-Bodied Anchovy, or Sprat (Anchovialla compressus).

This anchovy may be known by its deep thin body and long anal base. The latter is very much longer than the length of the head, and considerably longer than in the preceding two species. It is pale translucent greenish in color with a silvery band along the side that shades downward on the lower parts.

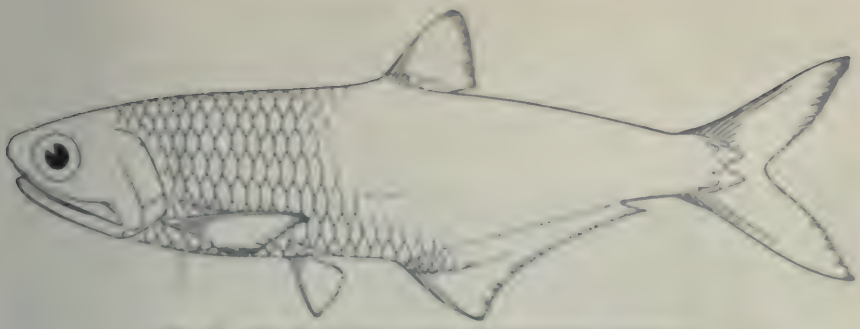

Fig. 42. The deep-bodied anchovy (*Anchovialla compressus*).

This anchovy grows to a length of five inches, and is found only on the southern California coast where it is abundant. Its flesh is thin and dry, and as a pan fish it can not be compared with the other two anchovies.

THE HERRING AND THE DEVELOPMENT OF THE HERRING INDUSTRY IN CALIFORNIA.

By N. B. SCOFIELD, in Charge, Department of Commercial Fisheries, California Fish and Game Commission.

The herring, of which there are several species, are found in the northern salt waters of both hemispheres. They are small silvery fishes, not usually exceeding twelve inches in length, but what they lack in size they make up in numbers, for they appear along the coast during their spawning seasons in vast schools and are caught by the fishermen principally at that time.

The herring catch in Europe in the year 1909 exceeded one and one-quarter billion pounds, valued at $21,500,000. The herring fisheries on the Atlantic coast of North America, while not as extensive as those of Europe, are, nevertheless, of great importance. In the state of Maine many millions of pounds of young herring are taken annually in traps or weirs and canned as sardines, but the principal herring fisheries are around Newfoundland, where the mature fish are caught and cured, either by salting or smoking.

The Pacific herring, *Clupea pallasii*, is found along the Pacific coast of North America from Alaska to Morro Bay in California, and south along the Siberian and Japanese coasts. Although a different species from that of the Atlantic, it is very closely related and is probably its equal in quality. So far the herring fisheries of the Pacific coast have not been greatly developed, for the reason that there is a prejudice against the Pacific herring, and the markets prefer the herring of the Atlantic, especially those coming from Scotland and Norway. This prejudice has, no doubt, been mostly due to lack of knowledge and a lack of care in preserving the fish on this coast. The first herring packed from British Columbia and Alaska did not come up to the standard of the European product and the trade immediately concluded

that the Pacific herring was inferior in quality. For years the fishery was neglected; the only part of the industry of importance was the rough salting of herring for the Oriental trade. More recently different companies have begun canning the herring and the fishery has begun to

Fig. 43. Herring gill netters at Belvedere Cove, San Francisco Bay, January, 1918. Photograph by N. B. Scofield.

grow. The United States Bureau of Fisheries during the past summer sent experts to Alaska to demonstrate the Scotch method of curing herring and it is believed by these experts, after the favorable reception of this experimental pack, that the Pacific herring can compete successfully with the herring of Europe.

Fig. 44. Drawing a herring seine on Richardson Bay, January, 1918. Photograph by N. B. Scofield.

In California very little has been done with the herring for their size is comparatively small and with the present methods of capture the fish are taken after they have begun spawning and are not in prime condition for salting or smoking.

The principal fishing is done in San Francisco and Tomales bays (see figs 43 and 44). The species of herring under discussion is reported to run in Morro Bay, San Luis Obispo County, and as far as is known that is the southern limit of its range. Going north from Morro Bay, the next point at which they are found is in Monterey Bay, where they enter Elk Horn Slough for the purpose of spawning. The schools are small and the fish themselves are of small size.

In San Francisco Bay the first schools appear in January and soon begin spawning. The eggs are attached to the rocks and seaweeds below low tide mark where they are supposed to hatch in a couple of weeks (see fig 45). The spawning continues until April, when the fish

Fig. 45. (a) Herring spawn on seaweed, San Francisco Bay, March, 1918. (b) A close view of herring spawn. Photographs by N. B. Scofield.

leave and are not seen again until the spawning season of the following year. The fish composing these schools are rather small, few of them reaching a length of ten inches.

The herring enter Tomales Bay a month earlier and schools continue to spawn at various places in the lower bay until March. They are considered the best herring in California and many of the fish reach a length of ten or eleven inches and are fatter than those found in other parts of the state.

Herring also spawn in Drakes Bay, Bodega Bay, Shelter Cove and Humboldt Bay. A careful survey will probably show that these fish are found in many other localities in northern California. The herring of Shelter Cove and Humboldt Bay are reported as being only seven or eight inches in length, which is smaller even than those farther to the

south. Size and fatness count for much in smoked and salted herrings and it is not likely that California will be able to do much in these lines on account of the small size of the fish.

It is customary to grade herring into four classes according to size. The largest, or number one, brings the best price. The majority of fish from Tomales Bay will fall into grades two, three and four, while those of San Francisco Bay will fall into grades three and four.

During the present season an expert of the Bureau of Fisheries supervised the packing of fifty barrels of herring on Tomales Bay after the Scotch style and it is expected that a good pack of Scotch cured herring will be put up on that bay next year.

In 1917 herring were canned for the first time in this state and for the first time fishing operations were conducted on a scale large enough to

Fig. 46. Transporting herring from Tiburon to the cannery at Pittsburg, January, 1918. Photograph by N. B. Scofield.

test the capacity of the fishery. There were taken in Tomales and San Francisco bays more than six million pounds of fish and it is estimated that these two bays can produce double that amount without overtaxing the supply. The size of the California herring makes it better for canning than for curing and we can look for the greater development along the canning line.

The methods of fishing, as in most of the other sea fisheries of California, are inadequate and can be improved greatly. On Tomales Bay small gill nets and beach nets are used and good catches can not be made until the fish have come into the shallow water to spawn, at which time they are less fat than when the roe and milt is not so fully developed. The herring enter and remain in the deeper part of the bay at least a month before they come inshore to be caught by the nets now in use. The fishermen realize this and are prepared to use purse nets and larger boats next year.

On San Francisco Bay the fishing methods are slightly better, but the introduction of purse nets or good-sized Lompara nets, would enable the fishermen to catch the fish before they are actually spawning.

The herring canning operations are so far being carried on at Pittsburg, at the junction of the Sacramento and San Joaquin rivers. Here canneries originally fitted for canning salmon and shad are being utilized and the fish are shipped to this point by boat from Sausalito and Tiburon. The herring from Tomales Bay make the first stage of their

trip by rail. So far herring canning has been somewhat in the nature of an experiment. If it proves to be a permanent industry, canneries will be built nearer the fishing grounds.

When the fish arrive at the Pittsburg cannery, they are put through a revolving scaler. They are next cleaned by hand, the work being done by girls and women. After a thorough washing they are next carried on belts through a drying chamber through which a blast of warm air is driven. This is to remove the excess moisture and to dry the surface of the fish so that they will not disintegrate when cooked and appear unappetizing in the can. They are next packed in one pound oval cans, seasoned with oil and spice or tomato sauce, then passed through an exhaust box for a preliminary heating. The covers are next crimped on the cans by machinery. They are now ready for the final cooking, which

Fig. 47. (a) Booth herring cannery at Hamlet, Cal. (b) Herring boxed for fresh fish market.
Photographs by N. B. Scofield.

is done in closed retorts where the cans are kept the required length of time under a pressure of a few pounds. After labeling, the cans are packed forty-eight in a box and are ready for the market.

Another favorite method of putting up the herring is to kipper them before canning. This is accomplished by taking the fish, after they have been cleaned, and hanging them in the smokehouse for about an hour. This dries them sufficiently and imparts to them the smoked flavor so agreeable to most of those who have eaten smoked fish. They are then packed in the cans and cooked as described above.

One of the most popular methods of curing herring is that of smoking. In this process the larger fish are placed entire in brine for 24 hours, then they are strung on slender three-foot sticks by running the stick through one gill opening and the mouth. These fish are then hung in the smokehouse, which is so built in sections or "bays" that the sticks on which the fish are strung may be placed in tiers. Beginning at the top, each "bay" is filled in succession. When the smokehouse is full the fish are smoked for about four weeks. They are packed in small wooden boxes and are then ready for the market. The larger California herrings are fairly good for smoking and when the fishing methods are improved so that the fish are caught while they are yet fat, a much better product can be turned out.

More herring should be used fresh in this state. The fish are of excellent flavor and, containing as they usually do the roe and milt, have a high food value. They can be had in large numbers during at least

five months of the year and the price is very low in comparison with other fish. With all this to recommend the fish, but very few are sold in the fresh fish markets. The public objects to the many fine bones which require time and effort to remove. While herring have been retailing for five cents per pound this winter, the public has spent much time and effort in complaining of the scarcity and high cost of fish.

Fig. 48. Herring smoke houses at Pittsburg, Contra Costa County, California, March, 1918. Photograph by N. B. Scofield.

DUCKS VS. RICE.

By GEORGE NEALE, Assistant, Sacramento Division, Fish and Game Commission.

A number of complaints having been made to the Fish and Game Commission of the destruction of rice by wild ducks, Mr. F. M. Newbert, president of the Fish and Game Commission, instructed me to make a full investigation of the same, learn the extent of the alleged damage; also to seek some method of defense against the loss. After a series of experiments conducted by myself and Mr. T. R. Cooper, of Gingg & Cooper, large rice growers near Live Oak, Sutter County, I am in a position to state that destruction of growing rice crops by blackbirds and waterfowl, if properly controlled, can be prevented. The only method heretofore utilized to obtain relief has been to use what is known as "fixed ammunition," or the regular shotgun loads of smokeless powder, with bird shot.

I do not hesitate to say that this method of securing relief is ridiculous on the face of it; for, to obtain relief, it can be seen that it would be necessary to kill every blackbird, duck and mudhen in the country, which is an impossibility and unnecessary. And, again, for the reason that smokeless powder is made to kill and not to frighten.

The waterfowl are on their regular migration southward and, finding the water and feed conditions favorable, they remain in the vicinity of the rice fields until driven south by lack of water, feed, and by weather conditions. Probably two-thirds of all the ducks in California are centered in the rice-growing area. The rice grower has a remedy at hand, but it must be used by concerted action on the part of all the growers, or the grower who does not co-operate will be the only sufferer.

It is known that for some reason ducks, mudhens and blackbirds attack certain rice fields while other rice fields are perfectly immune. Gingg & Cooper were perhaps the greatest sufferers last season (1916), and seeing the impossibility of obtaining relief by the use of smokeless powder and shot, and also not wishing to bring down upon their heads the state and federal officials, under whose jurisdiction the protection of waterfowl now comes, sought assistance from the Fish and Game Commission.

After a number of experiments with rockets, bombs and other explosives, a certain form of bomb was selected to do the work. Mr. Cooper ordered four dozen of these bombs at $5.00 per dozen, for use as an experiment on his fields where the birds were most abundant. He fired several bombs after dark, also at daylight, and two or three while the birds were in the air. He did this for three days and nights, with the result that there was a great decrease in the number of birds at every shot. He met with such success that he ordered five dozen more as an emergency.

In an interview with Mr. Cooper on September 26 he authorized the statement that there were no ducks or mudhens to be seen in his rice fields, that he had not killed a bird. (Also supplemented this statement later by saying that he had been unable to kill a duck on his land after the open season because the ducks were afraid to come on his place. Also that he had not used any quantity of the emergency purchase of five dozen bombs).

Certainly these birds were somewhere in the vicinity. Now, if there is co-operation among the rice growers to use these bombs simultaneously on the rice fields, the birds will leave for new grounds and will be driven to the overflow tule lands, where they will remain, *unless forced by hunters to return to the rice fields, which will occur if the open season is made at an earlier date than now, as is proposed by some.*

Many rice growers claim that at certain stages of growing rice, under certain conditions, the ducks are injurious to growing rice. Others deny this statement and say that while the ducks do injure the rice they are very beneficial to them, as they eat quantities of water grass and other noxious weed seeds. Be that as it may, the greatest hue and cry is made by the man who has no rice and because he can not wait for the open season on these birds. A number of such men were arrested this season while shooting ducks in closed season and not one of them owned an acre of rice. The rice grower will not permit trespassing on his fields at growing time.

President Newbert states that the Fish and Game Commission wishes to co-operate with the farmers and agriculturists and will always render them assistance in behalf of their great interests, but co-operation must come from the really interested man and not from a certain element whose only interest is to eat ducks before the season opens.

To obtain the most effective results in the use of the bombs *it is most important that they be used according to the following directions*: As large a number of ducks, mudhens and blackbirds as possible should be allowed to gather in the particular field which is to be bombed. Fire a bomb from each side of the field, at a low elevation, so that it will cover as great an area as possible. Have them fired at a certain given time, all at once. As soon as the birds rise in the air, slightly elevate the bombs to explode higher in the air than the previous ones and, if possible, shoot them into the birds. The bomb will not kill them, but will so demoralize them that very few will return. This should be done at daybreak, at noon and after dark. If done as directed every duck will be driven away and will remain away. New arrivals that have not taken this degree will of course have to be bombed away, but ordinarily two or three days and nights will rid the fields of all birds. This is also effective if used to drive geese from grainfields.

The name and address of the manufacturers of the bombs used in this experiment, together with prices and full information, can be obtained from Racliff Sales Co., 146 Davis street, San Francisco, California, or Ernst Behr, secretary Pacific Rice Growers' Association, Willows, California.

A LOOKOUT'S VIEW OF TRINITY GAME REFUGE.

By Frank Hoffman.

During the fire seasons of 1915, 1916 and 1917 I have acted in the capacity of lookout at the Hayfork Bally Lookout Station, which is situated near the center of the Trinity Game Refuge. Because of its location, Hayfork Bally might justly be termed the pivotal point of that refuge. Its altitude of approximately 6,262 feet affords an excellent view of the major portion of the area, which the deer have already learned to look upon as a haven.

During the period of my service at that station I have made a study of the conditions, both in the refuge and in the adjoining territory, and have kept in close touch with the stockmen and others who have occasion to travel through it. The present article is based on notes of my own observations and on information derived from the above-mentioned sources.

Excellent judgment was displayed in the selection of this area as a protected breeding ground, for it would have been difficult to find a more ideal location for that purpose. There is an abundance of all types of feed available at the various altitudes during the different seasons of the year, and ordinarily deer do not suffer because of lack of food during the winter months. But during the occasional severe winters a considerable number of them die of starvation, and as they increase in numbers, it will be necessary to provide a certain quantity of feed and thus enable them to weather these periods of stress. The deer, despite the occasional raids of poachers, are rapidly increasing in number, and if unmolested, the overflow will provide a continuous source of supply for the neighboring hunting grounds. Practically every mature doe that I have seen this season is the proud mother of two

fawns, and Mr. Fisher, the government trapper, reports that the same holds true in that portion of the refuge lying north of the Trinity River.

Coyotes and other predatory animals are quite numerous, and the fawns fall an easy prey to these beasts. Mr. Fisher reports having seen the carcasses of five deer, and upon investigation he placed the responsibility for their death upon coyotes.

Mr. Fisher is an industrious individual, thoroughly understands his business, and is making good as a destructive agency among predatory animals in the refuge. He is laboring under adverse conditions, for the deer and range cattle insist upon disturbing his "sets," but even so, since he has been operating here there are many familiar voices missing that one time gave tone and volume to the melancholy chorus, as the coyotes held their nightly concerts far out upon the distant ridges.

This area is amply provided with natural salt licks, but they are all situated in the lower altitudes, and the deer that frequent the higher levels are compelled to travel a long distance to reach them. During my terms of service on Hayfork Bally, I have salted the deer in that section, and I find that they patronize the licks freely during the summer months. The young deer visit the lick practically every twenty-four hours, and the large bucks and does visit it on an average of four times each week. I am firmly convinced that the deer I have salted do not go below the 2,500-foot level during the entire summer. The bucks, during the warm weather, love to roam in the cool regions of the high altitudes, and as food is abundant, they will remain there until the rutting season, if provided with salt.

Owing to the fact that I am able from my point of vantage to hear nearly every shot fired in the southern and central portions of the refuge, poachers do not often venture in during the months I am on duty, and by salting the deer at that time, they are kept out of harm's way, for it is a deplorable fact that some of the deer that go to the river licks never return. Mr. G. O. Laws, the excellent and efficient local representative of the Fish and Game Commission, recognizes the necessity of attending to this phase of the salting question, and has, at his personal expense, left a standing order at the Big Bar store for all the salt I might require for this purpose. With some of this salt, I have constructed a new lick near the spring where the deer water, and it was found and used by them the second night after being placed. At this date, about two weeks after I received the salt, there are seven large bucks and several does with their little ones who make almost nightly visits to the lick within fifty yards of my quarters.

The average resident of this district did not take kindly to the refuge idea, their principal cause of complaint being that it deprived them of their best hunting ground, but the contiguous territory is so well stocked with game that it is only a matter of their going in an opposite direction to hunt. However, the majority of them, if they do not approve of the idea, have learned to tolerate it, and respect the will of the majority. We are troubled by the presence of a few chronic offenders and malcontents, but that is an ailment which is prevalent in all small communities. That the present generation has no right to exploit the earth's resources at the expense of those who come after, interests these people but little. They have not as yet reached that state of near perfection when one, by properly schooling himself, is enabled to overcome that

little mite of selfishness, which, alas, exists in us all. They are unalterably opposed to any measure that curtails their self granted privileges, and the restrictions placed upon them by the enactment of game laws, they view in the light of an infringement upon their inalienable rights.

However, if it is impossible to educate them, a serious check may be placed upon their future activities. The rigid and impartial enforcement of the game laws by the resident deputy, and the ever-increasing sentiment in favor of game protection serves this purpose admirably, and while it may not result in their complete reformation, it compels them to proceed with more than ordinary caution.

But it is logical to assume that the offspring of this line, will, if no attempt is made to curb them, follow the footsteps of their fathers. The sympathy and understanding of the child is fundamental to the attainment of the conservation measures of the future. In some of our isolated school districts no attempt is made of adequately teaching nature study. In conducting the campaign of education along conservation lines it behooves us not to ignore the little mountain school ma'am. She is, potentially, a most important factor in the dissemination of knowledge along the desired lines. It is not only necessary to acquaint her with the names and habits of the different forms of wild life, but she must be made to understand the full significance of the word "conservation" as applied to them. It would be an excellent step in the right direction if the Forest Service, acting in cooperation with the Fish and Game Commission, could have the district ranger or other persons familiar with the subject visit these schools at least once each month and arrange field trips so that children might be more acquainted with the out-of-doors. I am convinced that the results attained would prove very encouraging.

CONSERVATION OF FORESTS INCREASES GAME.

By GEORGE W. COURTRIGHT, Deputy Fish and Game Commissioner.

Personal observation in Modoc and Lassen counties dating back to 1890, at which time forest fires were permitted to spread and destroy the reproduction of the forests, has convinced us that the present method of forest conservation is the correct one and that game increases with forestation.

We have personal knowledge of a forest fire which swept over almost the entire area of 14 townships in the fall of 1892. This was not at all exciting to the settlers for the reason that forest fires could be sighted at all times in the mountains. Fires were often willfully set. Hunters finding a secreting place for deer, such as an area of brush where they were hard to find, would simply set a fire and burn this hiding place.

In the 90's all reproduction through the forests of Modoc and surrounding counties was very small and cattle and horses could be sighted at a distance of a mile in some parts of the forest; in fact, it was a very uncommon thing to find young trees in the forests at all. Deer were scarce in the forested areas where they had no hiding places except in the shade of a large pine tree.

We were through Modoc County daily between 1896 and 1904. While we had plenty of grass and water, as we have today, we had practically no brush or forest reproduction. We had also very few mule deer, which is considered the most popular game animal of the western states.

We have more than two hunters now where there was one in the 90's, and yet the entire forested area of the county has now a growth of pine, fir and cedar, young trees that range in height from 4 to 12 feet. The reason for this young growth is due solely to added fire protection and scientific conservation of the forests. At present hunters have no difficulty in finding the mule deer. However, the hunter must be a good marksman if he gets a deer, because of the splendid cover afforded by the forests. Between 1890 and 1904 one could walk or ride for ten miles over most parts of Modoc County without even seeing a deer trail. At the present date it is quite common to hear a rancher say: "There are fifteen or more deer feeding on my meadow; we see them nearly every day somewhere about the ranch." These deer go back to the edge of the forest and rest in the brush during the heat of the day and feed early and late. They are found in the shade of thickets of young pine trees, which make a fine resting place for them. Were these sheltering trees and bushes burned, the deer would leave that locality.

We have observed that if the area is thickly forested, even where young brush and grasses, which are the natural food of deer, are entirely lacking, there are sure to be mule deer. We have never known of deer standing out in the open, say in a grainfield, where they could see for a mile in every direction; the thick timber is their natural habitat. Consequently, we believe that forest conservation has proved a great factor in the protection of game.

Further protection for the deer of this region is found in the fact that the officers of the Modoc National Forest are all game wardens, and that they have convinced the public that they are here to enforce the laws. The Forest Service thus becomes of double utility in game protection.

SUPREME COURT DECISION ON PARCEL POST SHIPMENT OF GAME.

(Reported 170 Pac. Rep. 412)

In re FRANK PHOEDOVIUS, on *Habeas Corpus*.

Application for Writ of *Habeas Corpus*.

For Petitioner—Nathan Moran.

For Respondent—Carl Westerfeld.

W. H. Lamar, Solicitor for the Postoffice Department, Washington, D. C., *amicus curiæ*.

The petitioner was convicted of a violation of the provision of section 627b of the Penal Code, which declares that "any person who ships any of the wild birds or wild animals or fish by parcel post is guilty of a misdemeanor," and adjudged to pay a fine of $25.00, and in default of such payment to be imprisoned. Held in the custody of the sheriff of San Mateo County by virtue of this judgment, he seeks his discharge on *habeas corpus*, claiming that this provision of law is invalid.

Said section 627b, as amended July 27, 1917 (Stats. 1917, p. 651), contains various provisions as to the conduct of common carriers and individuals in the matter of the shipment and the receiving for shipment of wild birds, wild animals and fish, and the transportation thereof, violation of any of which provisions is declared to be a misdemeanor. These provisions, which prohibit the receipt by a common carrier

from, or the transportation for any one person of more than the legal limit of game allowed to be taken or killed by one person, of the shipping or offer for shipment by an individual of any such excess, and which also require every common carrier to keep all shipments of game in open view, labeled with the name and residence of the shipper and of the consignee, and the exact contents of the package, were designed, of course, to prevent shipment of wild game illegally taken and to enable the authorities to more easily discover violations of the game laws, all with a view to the proper preservation of the wild game of the state for the people of the state. The section, as so amended, contains the provision involved in this proceeding, one entirely new in this state, but obviously having the same purpose as the other provisions. It is urged on his behalf in this proceeding that the provision of the statute is void as being both an unlawful interference with a federal instrumentality, viz., the postal service of the United States, and an attempt to regulate interstate commerce. Petitioner also claims that it constitutes an unlawful interference with the property right of citizens to use the United States mail, and that it is in violation of section 11 of article I of our own constitution, which requires that all laws of a general nature shall have a uniform operation.

Of course, no one disputes the proposition that the postal service is a federal instrumentality under the exclusive jurisdiction of Congress, and that a state may in no way regulate or burden the operation thereof. It is this very fact which furnishes the basis for the discrimination against the use of that service by our citizens in the shipment of "wild game" (included in which is fish, *People* vs. *Truckee Lumber Co.*, 116 Cal. 397), and in favor of other methods of shipment. When game is deposited in the parcel post it is at once subject to the exclusive control of the postal authorities under the statutes of the United States and regulations of the Postoffice Department, and absolutely free from state inspection and control. For reasons which are obvious the federal government could not tolerate the slightest interference with its officers and employees in the handling and delivery of the mail. For the purpose of protecting the game of the state for the use of the people of the state, the legislature has enacted many laws relative to the taking of game, some prohibiting the taking of certain kinds at any time, others prohibiting the taking of certain kinds except during a certain time known as the "open season" for such game, others limiting the number of certain kinds that may be taken by one person during a stated time, and so on. As a method of guarding against illegal taking of game it has been provided that the Fish and Game Commissioners of the state shall see that the game laws are strictly enforced, and "shall inspect all buildings, other than dwellings, and all receptacles, other than the clothing actually worn by a person at the time of inspection, where game or fish may be stored or placed, and all boxes and packages containing fish or game that are held for transportation by any transportation company or common carrier; * * * to inspect regularly * * * all boxes and packages, containing fish or game that are held for transportation by any transportation company or common carrier." Also to "seize and take possession of all game or fish," which has been illegally taken, killed or had in possession, or has been shipped or offered for shipment contrary to any of the laws of the state. It is necessarily conceded that these provisions as to inspection and seizure by the state officers of game shipped or offered for shipment can not be enforced as to shipments by mail. Any attempt to so enforce them would indeed be an attempted unlawful invasion of the exclusive federal jurisdiction. If these provisions for inspection and seizure of game found to be illegally taken are valid enactments of state law, the fact that they can not be enforced as to game delivered to the postal service for transportation furnishes a sufficient basis for excluding the parcel post from the means by which game may be shipped, in so far as any objection of special legislation or want of uniformity in operation under our state constitution is concerned.

The argument of learned counsel for petitioner in support of the proposition that the provisions as to inspection, etc., are invalid as improperly interfering with property rights, and that the provision here involved which precludes petitioner from using the United States mail for the shipment of game is in effect a deprival of his property right to use the United States mail without due process of law, to our minds fails to give due effect to the well settled doctrine as to the nature and extent of one's property right in wild game. That doctrine was stated by this court through Mr. Justice Van Fleet in *Ex parte Maier*, 103 Cal. 476, 483, in language subsequently approvingly quoted by the Supreme Court of the United States in *Geer* vs. *Connecticut*, 161 U. S. 519, 529, as follows: "The wild game within a state belongs to the people in their collective, sovereign capacity; it is not the subject of private ownership, except in so far as the people may elect to make it so; and they may, if they see fit, absolutely prohibit the taking of it, or any traffic or commerce in it, if deemed necessary for its protection or preservation, or the public good." The offense there charged was that of selling deer meat in violation of a state statute which prohibited any such sale in California. The meat sold was cut by the defendant from the carcass of an entire deer theretofore brought by him from the state of Texas, in which state it had been lawfully killed. It was contended that the statute did not and could not prohibit the sale of meat lawfully taken in another state. It was

held that the statute both did and lawfully could prohibit such a sale, and that while the law was of course intended only for the protection of the game of *this* state, the intention was to accomplish that very end by prohibiting the sale wherever game was in fact obtained, and that such a law was reasonably adapted to that end. All state laws reasonably looking to this end have consistently been maintained by the courts, the theory being that the ownership of the sovereign authority being in trust for all the people of the state, it is the duty of the legislature to enact such laws as will best preserve the subject of the trust and leave the beneficial use in future to the people of the state. In *Geer* vs. *State of Connecticut*, 161 U. S. 519, the Supreme Court of the United States upheld a statute of Connecticut which forbade the transportation without the state of game lawfully killed or taken within the state, or the having of such game in one's possession with the intent to procure its transportation beyond the state. In *Ex parte Kennedy*, 136 Cal. 527, a statute prohibiting the buying or selling of quail was upheld by this court. The court, through Mr. Justice McFarland, said: "Wild game belongs **to the whole people, and the legislature may dispose** of it as may seem to it best, subject only to constitutional limitations against discrimination. Within those limitations the legislature, for the purpose of protecting game, may pass such laws as to it seem most wise; and the measures best adapted to that end are for the legislature to determine, and courts can not review its discretion." It was held that the law did not destroy a right of property, the court approvingly quoting from *American Express Co.* vs. *State*, 133 Ill. 649, as follows: "The fallacy of the position consists in the supposition that the person who may kill quail has an absolute property in the dead animals. * * * The legislature has the right to permit persons to kill or take game upon such terms and conditions as its wisdom might dictate, and that the person killing game might have such property interest in it, and such only, as the legislature might confer. * * * The person killing quail under this statute has but a qualified property in the birds after they are killed. * * * But the law which authorized him to kill the quail has withheld the right to sell or the right to ship for the purpose of sale, and when such person undertakes to ship for sale he is undertaking to assert a right not conferred by law. The act, therefore, does not destroy a right of property, because no such right exists." In *State* vs. *Redman*, 38 Minn. 393, it was said that the legislature may adopt reasonable regulations not only as to the time and manner in which game may be taken and killed, "but also imposing limitations upon the right of property in such game after it has been reduced to possession." It was further said that such legislation deprives no person of his property, because the person reduces game to possession "subject to such conditions and limitations as the legislature has seen fit to provide." (*See*, also, *Silz* vs. *Hesterberg*, 211 U. S. 31.) Such has been the uniform course of decision. We are, of course, speaking of regulations which may reasonably be held by the legislature to look to the preservation of the game of the state for the beneficial use of the people of the state. The person taking or killing game, takes or kills subject to the limitations of any such reasonable regulation by the state, and his right of property therein is qualified thereby. We can see no good ground for a claim that regulations subjecting such game to inspection by state officers when offered for shipment or when in course of transportation under shipment for the purpose of enabling illegal takings to be illegally taken, are in any way an unreasonable exercise of the power of the legislature in this behalf. Whatever rights the shipper has in game shipped by him are subject to these regulations, as are necessarily the rights of the transportation company and the consignee. And the same thing is necessarily true of the law here involved prohibiting the shipping of game by parcel post. It is a reasonable complement of the regulations as to inspection, without which the inspection in course of transportation could be had only as to such game as is shipped by some other means than the United States mail. The person having game in his possession which he desires to ship, acquires and holds it subject to the condition that he will not ship it by parcel post, and no property right in such game is violated by a law which makes it a crime for him to do so. We are entirely at a loss to see how a person's property right to use the United States mail for all lawful purposes is violated by a law which prohibits his use thereof for the purpose of transmitting property which he has acquired and holds subject to the condition that he **shall not so transmit it.**

The case of *Ex parte Knapp*, 127 Cal. 101 (involving the question of the validity of a *county ordinance*) relied on by learned counsel for petitioner in this connection is sufficiently distinguished as to such a case as this by what was said by the court in *Ex parte Kennedy*, *supra*, as follows: "There is no question in the case at bar as to the reasonableness of an ordinance as in *Ex parte Knapp*, 127 Cal. 101, and other cases cited, the provision attacked here is a law of the state passed by the legislature."

The claim that the state law here involved is an unauthorized regulation of interstate commerce is, we think, fully answered by decisions of the United States Supreme Court, the final arbiter on this question. A similar claim was made in *Geer* vs. *State of Connecticut*, *supra*, and held to be without foundation. The court, through its present chief justice, after exhaustively discussing the question of property in wild

game, said: "The right to preserve game flows from the undoubted existence in the state of a police power to that end which may be none the less efficiently called into play, because by doing so interstate commerce may be remotely and indirectly affected. * * * The exercise by the state of such power therefore comes directly within the principle of *Plumley* vs. *Massachusetts*, 155 U. S. 461, 473. The power of the state to protect by adequate police regulations its people against the adulteration of articles of food (which was in that case maintained), although in doing so commerce might be remotely affected, necessarily carries with it the existence of a like power to preserve a food supply which belongs to all the people of the state, which can only become the subject of ownership in a qualified way, *and which can never be the subject of commerce except with the consent of the state and subject to conditions which it may deem best to impose for the public good.*" [The italics are ours.] In another portion of the opinion the court speaks of the "consequent power of the state to follow such property into whatever hands it might pass with the conditions and restrictions deemed necessary for the public interest." In the later case of *Silz* vs. *Hesterberg*, *supra*, a similar claim was made, and the court held that the law (one prohibiting the possession of wild game during the close season, whether killed within or without the state) was not directed against commerce or any of its regulations, but only indirectly and remotely affected the operations of commerce, and was of obligatory force upon citizens within the territorial jurisdiction of the state. The court said: "That a state may not pass laws directly regulating foreign or interstate commerce has frequently been held in the decisions of the court. But while this is true, it has also been held in repeated instances that laws passed by the states in the exercise of their police power, not in conflict with laws of Congress upon the same subject, and indirectly or remotely affecting interstate commerce, are nevertheless valid laws." It is sought to draw a distinction between these cases and the statute here involved, in that our laws permit the shipment beyond the borders of the state of game killed within the state, thus making game, it is said, "articles of interstate commerce." We do not consider the distinction material. The difficulty with the argument is that we have not made wild game an article of interstate commerce in the full and unrestricted sense. For so long as it remains within this state, at least, it remains burdened with the conditions imposed for the purpose of protecting the game of the state, to the effect that it may be shipped only in certain ways. As to this the language of Mr. Chief Justice White in *Geer* vs. *Connecticut*, *supra*, that such game "can never be the subject of commerce except with the consent of the state *and subject to conditions which it may deem best to impose for the public good*" is specially pertinent. Our own case of *Ex parte Maier*, *supra*, is also in point to the effect that there is in our law no unwarranted interference with interstate commerce.

The principles controlling the determination of the question just discussed are equally applicable to the claim that the state law here involved is an unlawful interference with the postal service of the United States. As said by respondent, there is no attempt here to regulate the postal establishment or in any way or degree to affect its operations. Looking to the proper protection of the game of the state for its people, the legislature has prohibited any person within the state from shipping it by parcel post. It must be assumed here that such provision is reasonably necessary to such proper protection. The sole purpose of the enactment is the protection of game for the people of the state. The most that can be said in this connection is that the law may indirectly and remotely affect the postal department by depriving it of this patronage and the consequent revenue which would be paid as postage. But this, we think, in view of the decisions we have referred to, can not be held to make the law invalid as unlawfully interfering with the postal service. In a well considered opinion, the court of common pleas of Northampton County, Pennsylvania, reached a similar conclusion as to a recent statute of that state which prohibited shipments of game by parcel post. (See *Com.* vs. *Reimel*, 44 Pa. Co. Court Rep. 557.)

We see no good ground upon which the statutory provision attacked may be held invalid.

The writ is discharged and the petitioner remanded to the custody of the sheriff of San Mateo County.

ANGELLOTTI, C. J.

We concur:

SHAW, J.
SLOSS, J.
MELVIN, J.
VICTOR E. SHAW, J. *pro tem.*
WILBUR, J.

CALIFORNIA FISH AND GAME

A publication devoted to the conservation of wild life and published quarterly by the California State Fish and Game Commission.

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April 15, 1918.

EAT MORE FISH.

THE UNDERLYING PURPOSE OF A "HERRING" NUMBER.

It is doubtless interesting and useful to anyone to know a herring when he sees it; to know where and when it is to be found and what are its nearest relatives. It is also instructive to read of the herring fishery of the Pacific coast, of the methods of catching, canning and curing of the fish. It is more pertinent still to know by actual test that herring and sardines are splendid food and that they are among the cheaper kinds of fish.

The "Herring Number" will fulfill its purpose only, if it interests its readers in the herring as a tasty meat substitute in the present war emergency, and consequently finds a larger place in our bill of fare.

SUPREME COURT UPHOLDS STATE LAW PROHIBITING SHIPMENT OF GAME BY PARCEL POST.

A case in the Supreme Court to determine the validity of the law passed by the last legislature prohibiting the use of the mails in the shipment of game resulted in a decision upholding the law. This law has been declared by many to be unconstitutional, and after its passage a ruling of the postal authorities which received wide publicity, prevented the search of parcel post shipments of game with the result that market hunters quickly took advantage of this opportunity to make illegal shipments. Frank Phoedovius, having been duly convicted of a violation of the provision of section 627*b* of the Penal Code, which declares that "any person who ships any of the wild birds or wild animals or fish by parcel post is guilty of a misdemeanor," took an appeal to the Supreme Court. The decision concurred in by all of the judges sitting in bank is printed in full on page 75 and should be read by everyone.

This decision is the fourth important one relating to game in California. Of prime importance was the decision in *Ex parte Maier*, 103 Cal. 476, 483, that "wild game within a state belongs to the people in their sovereign capacity" and is not "the subject of private ownership." A decision upholding a statute prohibiting the buying or selling of quail was handed down in connection with *Ex parte Kenneke*, 136 Cal. 527. The handling of game by "transfer companies" was held invalid in the Superior Court by the Honorable Judge Frank J. Murasky. As a fitting climax to these cases comes this decision on the shipment of game by parcel post (*In re Frank Phoedovius*, on *Habeas Corpus*, Crim. No. 2108. In bank, January 17, 1918; Pacific Recorder, Vol. 170, p. 412).

MARKET HUNTERS MAKE CAPITAL OF THE PRESENT EMERGENCY.

On the plea that letting down the bars on fish and game will help furnish additional food supply, a dangerous attempt has been made to destroy the protection which has taken years to build. The conservationists in almost every state have had to fight these attempts to break down protective laws. Many persons even, from lack of appreciation of the consequences, have espoused the attacks on protective laws. As one editor points out, "To suspend the fish and game laws would be like deciding to kill all of the hogs and cattle at once, to avert starvation before feeling the pangs of hunger, and thus insuring shortage at a later period when hunger might be felt."

Typical of those who would make capital of the present emergency is a spokesman of the fish industry in Texas who exclaimed, "Damn posterity; lets get the fish." Unfortunately, this is the

attitude of some commercial interests. A great pretense of being interested in conserving the supply in order to insure their own interests is made, but under this veneer is avarice and selfishness.

This is what the commercial interests in Texas demanded:

1. Suspension of the closed seasons for the period of the war.
2. Removal of restrictions on weight, size, the use of seines and the dredging of oysters.
3. The drafting of new fish and game laws.
4. Removal of protection from fish-eating birds.

To the credit of Governor Hobby of Texas no change in the laws has been made, but so plausible was the plea made by the commercial fishermen that the removal of restrictions was narrowly averted.

Every conservation unit should be mobilized and held ready to withstand a similar attack in this state. Already slight skirmishes with the enemies of wild life have been recorded.

FISH LAWS MODIFIED BY FOOD ADMINISTRATION.

At an important meeting, charged with great interest to the consumers and producers of sea fish held Saturday in Federal Food Commissioner Merritt's offices in San Francisco, the first definite action towards speeding up California's fish production was taken.

It was found that the state laws in the main do not restrict the full development of the fisheries and it was further found that in only a few cases, do they prevent fish from being generally used as food. For example, in order to protect certain game fish, their sale has been prohibited. It was deemed wise during the period of the war to remove such restrictions. Under authority an act of Congress entitled "An act to provide further for the national security and defense by encouraging the production, conserving the supply and controlling the distribution of food products and fuel," approved August 10, 1917, President Wilson issued a proclamation empowering the Food Administration to annul any restrictive legislation whose conservation features seemed to the Food Administration less essential during the present crisis than the incidental curtailment of food supply in the present days of international need.

After a lengthy discussion the following changes in the state law were decided on:

1. California whiting, also known as corbina or surf fish, yellow fin croaker and spot fin croaker, the sale of which is now prohibited by the state law, may until further notice be sold.

2. The possession of paranzella or trawl or drag nets shall not be unlawful while in transit over the waters of Fish and Game District 19, as defined by the state laws, but such nets must not be used or dragged within said district under penalty of revocation of the federal license.

3. Bait nets may be used in Fish and Game District 20 (Santa Catalina Island) for the purpose of taking bait only.

4. Halibut below the four-pound minimum weight prescribed by the state law may hereafter be sold provided they are caught in conformity with the laws of this state as above modified.

The attention of all fishermen is particularly called to the regulation requiring every salt water fisherman to procure a license from the United States Food Administration, application for which can be had at the Food Administration's offices. The license of any fisherman violating any of the federal or state laws as above modified or any rule or regulation issued by the United States Food Administration will be revoked and such fishermen will not thereafter be permitted to engage in the vocation of fishing.

DISCRETIONARY POWERS INSURE BETTER CONSERVATION.

Many Eastern states are finding it advantageous to grant sufficient discretionary powers to the fish and game commission to allow a change in seasons and bag limits when unusual conditions arise. Immediate protection is sometimes necessary and a wait of one or two years for a session of the legislature is often dangerous. Here in California we persist in delegating to the legislature every change in the game laws. No matter what the emergency, no lawful change can be made in the fish and game laws except at the biennial meeting of the legislature. If

deer are practically exterminated by disease in Trinity County, hunters are allowed, under the law, to take the same toll as is taken in other counties. If quail in Inyo County are endangered because of severe winter weather no relief can be given until the following meeting of the legislature and then the necessary legislation may not pass.

The best conservation policy is found in immediate protection whenever conditions warrant it. The legislature should delegate to the Fish and Game Commission sufficient power to efficiently administer wild life resources. A check on any change may easily be provided for by requiring petitions with a set number of signatures or by insisting on the signature of the governor.

Watch the next number of CALIFORNIA FISH AND GAME for more information on the subject.

INCREASED SHEEPING ENDANGERS WILD LIFE.

Great pressure is being brought to bear to so change the regulations regarding grazing in the national forests as to allow sheeping in national parks and increased sheeping in national forests. This may sound favorable so far as increased meat supply is concerned, but anyone who has seen the deep traces left in sections where sheep have grazed will shudder to think what results are to be expected. Many are the wornout meadows, deeply gullied, which now testify to the past inroads of herds of sheep, and many the depleted game covers where the trampling of nests and the destruction of food has reduced upland game birds to the minimum. These are dangerous times and every conservationist must help form the army of defense needed to save wild life in this emergency when special opportunity to devastate wild life resources is given the enemy.

FEDERAL MIGRATORY BIRD LAW BEING ENFORCED.

In spite of the lack of funds and lack of legislation backing the Migratory Bird Law, a report from the Chief of the Bureau of Biological Survey shows that many arrests have been made and that the law is being enforced. The 16 inspectors and 186 federal wardens have reported during the last year 208 cases of violations of the regulations. Since the law became effective prosecutions have been made in 29 cases, resulting in impositions of penalties in all but five.

That the violations reported by no means approximate the number that have occurred is to be expected and is due to the impossibility in many cases under the law of securing evidence sufficient to convict. Possession of wild fowl during the closed season is not a violation under the federal act, and there must be evidence of actual shooting or capture on which to base prosecution. Furthermore, inspectors and wardens appointed under authority of the law have no power of arrest, and hence many violators escape.

Notwithstanding the difficulties attending enforcement, the present law is very generally observed, and communications received from fish and game commissioners and other persons contain incontrovertible evidence that since the law became effective a very marked increase in the number of waterfowl and shorebirds has been noted in most of the states; that wild fowl have become unusually tame in spring; and that many thousands of waterfowl are breeding in certain localities where they had not nested for many years. The consensus of opinion attributes these greatly improved conditions to the abolition of spring shooting and the general observance of the regulations.

STILL IN THE SAME CLASS.

The Sportsmen's Review of February 16, 1918, comments thus on the sale of game:

WAKE UP.

In all this fair land there are still two states, Louisiana and North Carolina, which permit the hunting of game for market.

In all this fair land there is no state which has enough game left to feed it to epicures who are too lazy to go out and get it themselves.

In all this fair land there is no real sportsman who would allow market hunting in his native state without a protest.

We suppose that our partial prohibition of the sale of game saved us from being included with Louisiana and North Carolina. So long as we continue the sale of ducks and geese we in reality belong in the same class. Wake up! California!

COUNT THE DUCKS.

The accompanying photograph was taken on the overflow from Butte Creek, just northwest of the Marysville Buttes, on February 2, 1918. The picture gives evidence that two days after the season closed there were still plenty of ducks left in this vicinity despite the toll taken by numerous gun clubs. At least 98 per cent of the ducks in the picture were mallards. A slight sprinkling of pintails, baldpates

A day's wondering through the woods is likely to result in the addition of one or more sets of rare eggs to the collection of the wonderer.

Take the advice of the editor and wonder.

CONSERVATION SENTIMENT GROWS.

We do not have to go very far back in the history of our state to find the time when a game warden held a political job. The first warden in the state was a market

Fig. 49. Mallards and still more mallards. A photograph taken at the mouth of Butte Creek, near Pennington, Sutter County, California, two days after the 1917-18 season closed. Photograph by H. C. Bryant.

and green-winged teal was noted. Beyond the birds in flight was a mile of water, black with ducks. Although geese were not numerous at the same date the picture on page 84 shows that a few still remained on the loafing grounds in the vicinity. There is a notable concentration of ducks in this vicinity, probably occasioned by the abundant food supply furnished by grain and rice fields.

ANOTHER EDITOR WONDERS.

The tedious routine of an editor's life is often enlivened by his exchanges. The apparent lack of proof reading in one exchange that comes to our desk so invariably furnishes amusement that it is scanned as one would read a funny magazine. Here is the latest on the front page:

FEBRUARY.

February is the month for Owls. It is this month that the big North American owls of various species collect their nesting site, and frequently lay their eggs.

hunter himself and, instead of prosecuting offenders, profited by added protection. He marketed 107 25-pound sacks of game during the first year of his appointment. Contrast this condition with the situation at the present time and you will discover that conservation sentiment has grown rapidly. Now wardens are appointed on merit and their sole duty is to enforce the fish and game laws. That they actually do enforce these laws is evidenced by the number of convictions obtained from month to month, reports of which are always to be found in CALIFORNIA FISH AND GAME.

NEW PATROL BOAT "MAKES GOOD."

"Albacore," latest acquisition of the Fish and Game Commission for commercial fisheries research and regulation work in southern California ocean waters, has taken up the business for which she was built, and is now patrolling the waters between the mainland and the channel islands, devoting a great deal of her time

to careful scientific investigation of the many marine problems which are of greater interest to the growing canning industry and the fish-consuming public today than ever before.

The new boat has acquitted herself thus far even better than Captain Nidever had dared to hope. Having superintended every detail of her construction and feeling confident of her seagoing qualities, Nidever stood out from under the lee of Catalina Island at the height of the heaviest storm of the winter and gave his command a full-speed drive right into as rough a seaway as ever she is likely to find in the regular course of duty. "Albacore" stood up to her work splendidly; kept above everything but spray, shipping no solid water at all.

In design, while following in general the approved practice of the most successful fishing-boat builders for southern conditions, the "Albacore" departs somewhat in behalf of greater speed without sacrifice of sea-keeping ability, attained largely through a refinement of lines. Much more in the way of human comfort has been built into her also, as the state men, wardens and investigators who must live and labor aboard for days at a time are to make of her a floating home and workshop combined. Especially when making experimental hauls of scientific gear to prospect the sea floor the boat is designed so as to use a sail and make use of favorable winds, thus saving distillate.

The commercial fisheries research department of the Fish and Game Commission has laid out a comprehensive program of investigation work for the year, fraught with prime importance to the fishing industry and through it, the entire public. Mr. William F. Thompson, ichthyologist, has been busy with studies of the albacore, halibut and sardine, striving to free the atmosphere of some of the theories prevalent by finding out the exact facts, some of which can be ascertained with convincing certainty. He has been working on the boat much of the time. The Japanese albacore experts from the Imperial Fisheries College of Japan have made numerous trips upon the new boat whose name commemorates the wonderful fish that in a few short years has succeeded from the status of once despised by all, to the exalted plane of premier commercial importance in the South, a standing testimonial to the pitiful truth that the American food-consuming public doesn't know a good thing when it sees it, but has to be convinced by barrels of printer's ink, and the adoption of a different name!

Quite a lively interest attaches to the work of the Japanese albacore fishermen, whose experiments with long-line and deep-trolling methods are being embodied in an exhaustive report.

In the South, the public long since has learned to take the little brown men mighty seriously as fishermen; and in going to Japan for the most advanced scientific thought in marine fisheries methods, the Fish and Game Commission sought to standardize the production of albacore by demonstrating methods to catch them in winter. This was an intelligent following-up of Mr. Thompson's summer work in demonstrating that the albacore merely descend to lower levels in the colder weather, rather than migrate as many previously had supposed. The value of a discovery that would stabilize the albacore supply is so well appreciated by the big southern fish packers that every detail of the work of the state toward this end is being watched with keenest interest by these men who have put southern California on the map as a source of seafood supply for the world.

Among other objects of the "Albacore's" work this summer is that of extending the known range of the rich and delicious sablefish to include the deeper off-shore banks of southern California. Rock cod fishermen get a sprinkling of fish they call "black" or "blue cod," and it has been noted that the rock cod seem to run larger on the deeper parts of a bank; so by systematically working the depths, the present small size of the sablefish may give place to a fish whose proportions are more nearly those of commercial requirements. The federal government made quite a publicity campaign in behalf of the sablefish some time ago; and the fish needs all the promotion it can get, as people in the South are not educated to it as yet, only a relatively few housewives understanding what a choice and always desirable boiling or broiling fish it is, the

larger ones being quite as choice for frying when filleted. Frying, despite all educated effort to the contrary, continues the popular method of cooking fish because easy. EDWIN L. HEDDERLY.

YOSEMITE HATCHERY PRACTICALLY ASSURED.

For many years different persons have suggested to the Fish and Game Commission that a state hatchery be placed in Yosemite Valley. On the earnest solicitation of those interested, a careful investigation of the situation was made by Commissioner Bosqui, W. H. Shebley, in charge of fishculture, and Field Agent E. W. Hunt. Convinced that proper facilities were offered and that such a hatchery would be of great educational value in demonstrating the work of the commission, plans were made for the immediate installation of a suitable hatchery plant. The site was even selected. Governor Stephens, who happened to be in the valley at the time of the investigation, approved the plan. Supervisor Lewis of the park has also been a strong advocate of a Yosemite hatchery.

After considerable delay arrangements are now being consummated with the Department of the Interior so that a fine hatchery building will probably soon be under way. At first it seemed that on account of the plans of the Bureau of Fisheries a hatchery built by the state commission would be impossible. A letter from Alexander Vogelsang, first assistant secretary of the Department of the Interior, clears the situation and makes proposals which should prove satisfactory. The state commission will be able to obtain a lease for a term of years and sufficient water rights to properly provide for a hatchery. This same letter also suggests the possibility of a new hatchery in the Sequoia National Park. An investigation is soon to be made to ascertain whether this is feasible.

GEESE DAMAGE CROPS NEAR TULARE LAKE.

The unusual conditions arising from the lack of rain caused serious damage to the crops in the vicinity of Tulare Lake during February. Great numbers of geese concentrated in this vicinity, fed in the grainfields and destroyed the grain as it appeared above the ground. After the close of the season the geese became very tame, and it was difficult to herd them from the fields. Ranchers appealed to the State Council of Defense and to the Fish and Game Commission with the result that an investigation was instituted and arrangements made so that crops could be protected.

Fig. 50. Geese on loafing grounds near Pennington, Sutter County, California, February 2, 1918. Photograph by H. C. Bryant.

During normal years these same birds feed on native plants and grasses and what little damage is done to grain is so distributed over a wide area that no one takes notice of it. This year the only green feed in the vicinity was to be found in the grainfields sprouted by irrigation.

Existing conditions made the problem a difficult one. Ranchers, urged to raise a maximum crop of wheat, believed protective game laws prevented their protecting crops. Of course the rights of the farmer were immediately championed by townspeople who thought they saw an oppor-

munity to hunt geese out of season, but few took into consideration the conservation of the geese. Geese are very greatly diminished in numbers, and they are in need of careful protection in order that the necessary breeding stock be maintained. Promiscuous spring hunting would necessarily endanger breeding stock.

A misleading statement which appeared in newspapers to the effect that, owing to damage to grain crops by the geese near Tulare Lake, people would be allowed to kill geese, brought countless inquiries to the Fish and Game Commission offices and stirred up "a tempest in a teapot." The statement suggested that under the circumstances the Fish and Game Commission would "wink at the law" giving protection to geese. A treaty with Canada, the federal Migratory Bird Law, and a state law all provide for an open season of three and one-half months, from October 15 to January 31, inclusive. It would take both federal and state enactments to provide a longer open season. Under such circumstances, even under the pretext of an emergency, the Fish and Game Commission had no power to change the present law. Furthermore, the Commission, knowing the resulting difficulty of law enforcement, refused to "wink" at any law on the statute books. It was of interest to find that, although geese were causing real damage, the rancher neither wished to slaughter the geese nor to allow others to slaughter, but simply wanted to protect his crops. By far the greater complaint of damage came from townspeople who, under the pretext of helping to protect crops, desired a chance to hunt geese out of season.

Fortunately, a rain scattered the geese soon after agitation was at its height and ranchers had little difficulty in protecting crops. Herding the geese from the fields with rifles and frightening them with bombs were the two methods most widely used.

A NEW AQUARIUM FOR SAN FRANCISCO.

Mr. Sigmund Steinhart, a philanthropic citizen of San Francisco, provided in his will sufficient funds to build a fine aquarium. The building is now nearly completed and will cost $250,000. Both fresh and salt water fish will be displayed. Outdoor pools will be provided for seals, sea lions, porpoises and other aquatic mammals. The aquarium is situated in Golden Gate Park and is to be under the direct control of the California Academy of Sciences. The funds for the maintenance and the operation of the Steinhart Aquarium will be furnished by the city of San Francisco. A charter amendment submitted to the voters of San Francisco in November, 1916, directs the supervisors to include an item of not less than $20,000 in their annual budget to be used for the maintenance of a public aquarium. This aquarium should do much to educate the people of the state regarding fish life and fisheries.

MANY TONS OF SHARKS MARKETED.

Large catches of sharks were reported during the last two weeks of January, 1918. The greater number of these sharks were the well known dog fish but a few Henlis sharks were also taken. These fish averaged from four to six pounds. Such a large number were caught that many were thrown overboard and doubtless the total catch was well up to the 100,000 pound mark.

A NEW HATCHERY ON KLAMATH RIVER IS PLANNED.

A law recently passed by the legislature provides that when it is proved unfeasible to install a fish ladder over a dam, a power company will be required to install a fish hatchery instead. A similar law has been in operation in Alaska for several years. The first hatchery to be erected under this law will probably be placed on the Klamath River near Copco, where the California-Oregon Power Company has a 130-foot dam. Experts have proved that a fish ladder over this dam would be impracticable. The California-Oregon Power Company has therefore agreed to the erection of a hatchery on its property on Fall Creek. The United States Bureau of Fisheries which has operated a spawning station lower down the Klamath River has given up its work at this location and relinquished control to the California Fish and Game Commission.

The solution of the problem arising from the Copco dam has thus been solved and improved fishing conditions on the Upper Klamath River are to be expected.

FEW STURGEON LEFT.

During August, 1915, a giant sturgeon was caught in the Feather River, two miles east of Live Oak, by W. A. McAuslin. With the aid of J. J. Haken, Mr. McAuslin soon landed the fish. Small white fish baited to three bass hooks at the end of a common chalk line were used in its capture. The sturgeon swam into shallow water and after shooting it several times the men had no difficulty in landing it. This fish, a male (see fig. 51) was seven feet long and weighed one hundred and sixty pounds. Another fish, evidently its mate, was seen in the river at the same time.

This fish was caught before the sturgeon was given total protection. Once extremely abundant in our larger streams and considered poor food, the sturgeon, now that it is the nearest extinct of all of our food fishes, is considered a delicacy and every attempt is being made to increase its numbers.

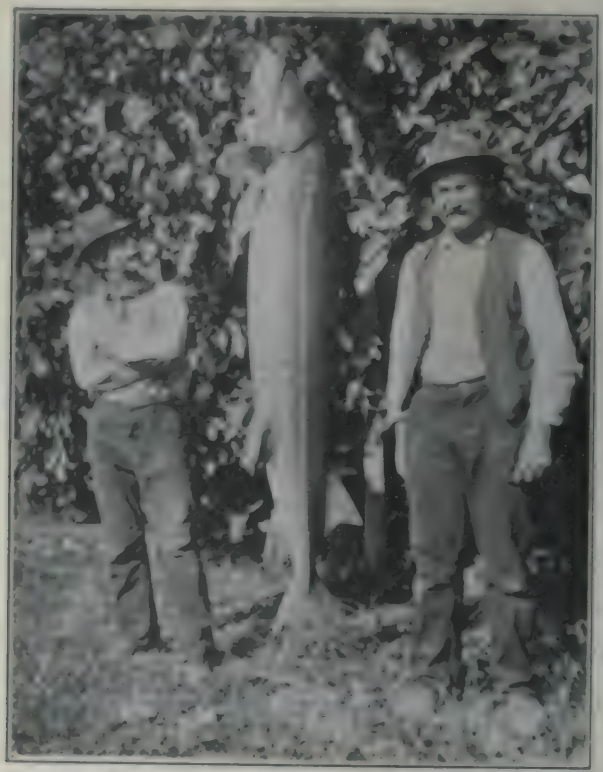

Fig. 51. Giant sturgeon weighing 160 pounds, caught near Live Oak, California, in August, 1915. The sturgeon is so nearly extinct in waters of this state that it has been given total protection.

AN ALL-WOMAN JURY CONVICTS NIGHT SHOOTERS.

In January a jury of twelve women, the first jury so far as is known made up entirely of women to try a fish and game case in California, heard the evidence and brought in a verdict of guilty, at Willows, Glenn County. Four Colusa duck hunters were arraigned on the charge of night shooting. On January 4 they were tried by a jury of men who disagreed seven to five in favor of acquittal. The new trial was set for January 14, and twelve women were seated as jurors. The case being historical it may be of interest

to record the names of the women selected. They were as follows: Mesdames Lulu B. Burgi, Ellen Hunter, Eva O. Halterman, Hattie Lace, Jane E. Bielar, Bell C. Feige, Francis J. Davis, Katherine A. Keim, Annie C. Lohse, Laura Cummings, Sallie Wood, and Ida Cook. Each promised to support the law on the evidence presented, and the result was a verdict of guilty. Although the atttorney for the defense, charging fraud, petitioned for a new trial, the petition was denied and sentence of $100 each or one hundred days in the county jail was imposed.

An astonishing plea in behalf of the defense by Attorney Belieu was made. He argued that in view of the fact that the 287 ducks which were confiscated from the hunters and donated to charity were worth between $150 and $200, a lenient fine should be imposed on account of the value of the ducks contributed to the county. This argument was met by Attorney Duke of the Fish and Game Commission in the reply that game illegally killed is not the property of the defendants in any case and can not be used in partial payment of their fine any more than it would appear feasible to allow a convicted chicken thief to present his booty as part payment of his fine.

WHALE MEAT NUTRITIOUS.

Analyses of whale meat made at the University of California Experiment Station show that this meat is very nutritious. It contains 23.31 per cent protein, a larger percentage than is contained in average beef. Other constituents of whale meat are: water 71.22 per cent, ash 1.02 per cent, and undetermined substances .21 per cent. Whale meat is as easily digested as beef and, like other meats, is more readily digested than eggs.

There are tough cuts as well as tender cuts in whale meat. Its preparation should, therefore, vary accordingly. Whereas, tender whale steaks can be broiled, savory stews should be made of the tougher portions.

LION BOUNTIES IN 1917.

The complete returns on the number of mountain lions upon which bounties were paid in 1917 show that the decrease of several years ago has changed to a slight increase. During 1917 a bounty was paid on 188 lions as against 179 in 1916 and 162 in 1915. The number for 1917 is only about half of the total paid in 1908 when the bounty law first went into effect. If the number of bounties paid is any criterion of the abundance of lions, Humboldt County must be considered the state with the largest lion population, for the total bounties paid to residents of Humboldt County is 534. The nearest competitor for this honor is Siskiyou County with 240. Trinity is a close third with 234. The total number of bounties paid up to the end of 1917 was 2,713.

NEW GOOSE DISCOVERED IN CALIFORNIA.

In a state where ornithology is so widely studied as California it seems incredible that so large a bird as a goose should remain unknown to science until this late date, but such is the case. Two well-defined subspecies of the white-fronted goose (*Anser albifrons*), called by the hunters, speckled-bellied goose, occur in California during the winter months, where but a single race has been heretofore recognized, according to a paper written by H. S. Swarth and Harold C. Bryant (Univ. of Calif. Publ. Zool., Vol. 17, pp. 200–222, October 9, 1917).

The new "tule goose" or "timber goose" is distinguished from its relative, the common white-fronted goose by its greater size, its call notes, its browner tints, its yellow eye ring, and the possession of a greater number of tail feathers. To anyone handling the birds in the flesh the differences between the two are obvious beyond dispute.

The specimens of tule goose obtained for study were all taken near West Butte, Sutter County, California, and are all winter birds. No breeding birds were available for comparison, thereby making it impossible to indicate the summer ranges of the two forms. However, the following theoretical breeding ranges are suggested by the authors. The white-fronted goose is known to breed in western Alaska and it is probable that the breeding grounds of the tule goose are to be found further to the eastward in Arctic America.

While the tule goose seems to occur regularly in Sutter County during the winter, there is no data demonstrating its

presence at any other point in the state. However, a rumor persists among market hunters of the Los Banos region that a large form of white-fronted goose exists and has been killed there.

It is said that the tule goose is never seen in such large flocks as is customary with the white-fronted goose but is most frequently noted singly or in pairs, also that it is preeminently a denizen of open water or ponds and sloughs surrounded by tules and willows.

It was interesting to find that the original description of the American white-fronted goose by Hartlaub more nearly fits the tule goose and that consequently the name *Anser albifrons gambeli* must be made to apply to the tule goose, the common white-fronted goose assuming the name *Anser albifrons albifrons* in common with the white-fronted goose of Asia.

Waterfowl hunters will hereafter be justified in giving the large white-fronted goose with bill 53-62 millimeters in length the name of tule goose and the smaller white-fronted goose with bill 44-52 millimeters long the name of white-fronted goose.—AMY M. BRYANT.

FAIR PLAY.

(A page of criticisms and answers.)

RAISING RICE FOR WILD GAME CONSUMPTION.

Editor *The Chronicle*—Sir: I bought a wild duck in a market in Sacramento a few days ago and when I dressed it I found at least a half ounce of rice in its craw, and many grains embedded tightly under each wing, showing beyond a doubt that it had beaten the rice stalks down in order to get at the grain. If this were called to the attention of Mr. Newbert, president of the State Fish and Game Commission, he would likely explain by saying that some mudhen had stuck the grains of rice under the duck's wings while in deadly combat with the duck.

W. D. BLUDWORTH.

Sacramento, January 28, 1918.

—*S. F. Chronicle*, Jan. 31, 1918.

THEY DINE ON THE LEAVINGS.

Editor *The Chronicle*—Sir: My attention has been called to a little item which appeared in the Safety Valve column of your paper of January 31. It was headed "Raising Rice for Wild Game Consumption," and bore the modest signature of W. D. Bludworth of this city. Mr. Bludworth asserts he bought a wild duck in the market recently and he found at least a half ounce of rice in its craw and many grains of the cereal embedded tightly under each wing, showing beyond a doubt that the duck had beaten the rice stalks down in order to get at the grain. I would share Mr. Bludworth's apprehension and indignation were it not for the fact that my knowledge of ducks goes slightly beyond "craws." It may interest Mr. Bludworth to know that ducks do not have craws, they have gullets. Craws are peculiar to chickens and turkeys. The rice crop was fully matured and cut by November 1 (over three months ago) and was threshed, sacked and stored more than one month ago, so the duck mentioned by Mr. Bludworth apparently had "put one over" on Hoover and had hoarded that rice under its wings for three months after the crop was in. The rice found in Mr. Bludworth's duck can be accounted for by the fact that there is a large amount of rice lost in harvesting the crop. This lost rice serves as food for many varieties of birds and if left on the ground it would grow into a form of water grass that is particularly obnoxious to rice farmers. On the whole, if Mr. Bludworth's statement is to be accepted without question, I would say he had purchased not a duck but a pin-feathered freak of nature. Mr. Bludworth says it was a wild duck. It's enough to make any duck wild. The question is "When is a duck not a duck?" Answer: When it's a quack.

GEORGE NEALE.

Sacramento, February 6, 1918.

—*S. F. Chronicle*, Feb. 10, 1918.

FACTS OF CURRENT INTEREST.

The new commercial fisheries patrol boat was successfully launched at San Pedro, December 27, and is now in commission.

The fishing season opened auspiciously April 1, a return to an earlier date after a try at a May 1 opening.

More than four thousand ducks and geese, illegally taken or shipped, were confiscated during the past open season and donated to charity.

All deep sea fishing is now under government control. Each fisherman is under license and an attempt is being made to reduce the price of fish to the consumer.

Five aliens convicted of killing songbirds recently paid fines approximating $200.

Striped bass market fishermen persist in violating the law, as is evidenced by the confiscation of 5,644 pounds of this fish during November, December and January. All of this fish was donated to charity.

At the Mount Shasta Hatchery there are 13,000,000 young salmon awaiting distribution.

During January the first jury made up exclusively of women to try a game case brought in a verdict of guilty and the four Colusa hunters convicted of night shooting were sentenced to $100 fine or 100 days in the county jail.

The largest albacore ever taken on rod and reel was secured by Mr. Elijah Pringle of Tuxedo Park, New York, on February 14, 1918, while fishing near Catalina Island. The fish, which weighed 81 pounds, took twenty-nine minutes to land. Two other albacore recently caught weighed over fifty pounds. The record albacore previous to the Pringle fish weighed 67 pounds and was taken by Tad Grey on January 11, 1918.

Until this year it was believed that the albacore entirely disappeared from the waters of southern California during the winter season. Investigation has shown that a few large fish of this species remain each winter and the former theory is entirely upset by the large catches of several hundred fish weighing over forty pounds which have been taken this past winter.

Severe penalties were recently meted out to two trappers who had failed to secure licenses. One paid a fine of $15 and the other was sentenced to 40 days in the county jail, it being the latter's second offense.

HATCHERY NOTES.

W. H. SHEBLEY, Editor.

MOUNT SHASTA HATCHERY.

With the completion of the work of distributing the 1917 hatch of fish from the different hatcheries, work on preparing for the collection of trout eggs for the season 1918 was immediately commenced.

The buildings, hatching troughs and pond system have been given a general overhauling; work was completed before the winter storms set in.

Fig. 52. Seining spawning salmon at Bryan's Rest Egg Collecting Station on Eel River, Humboldt County, California. Photograph by S. Campbell.

Thirteen million salmon eggs were received at this station, and the resulting fry are now being reared for distribution in the upper reaches of the Sacramento and Klamath rivers. A portion of these fry will be distributed during the coming spring and the balance held over summer in the three large rearing ponds and planted during the fall of 1918.

The taking of Loch Leven and Eastern brook trout eggs from the adult fish carried in the ponds at Mount Shasta Hatchery was very successful this year; 1,870,000 Loch Leven fry and 1,350,000 Eastern brook fry were hatched from the eggs secured. These fry hatched out in excellent condition and will be ready for distribution during the middle or latter part of May.

Rainbow egg-collecting operations were commenced during the fore part of February at Mount Shasta Hatchery and at the Klamath River stations; to date approximately 500,000 have been taken. While the season is late, owing to very unusual weather conditions, we believe that the operations on the Klamath River will result in an average take of rainbow trout eggs.

MOUNT WHITNEY HATCHERY.

The 150,000 Eastern brook and Loch Leven eggs which were shipped to Mount Whitney Hatchery have hatched out and are doing nicely. It is proposed to ship a sufficient number of rainbow and steelhead trout eggs to the Mount Whitney Hatchery from other hatcheries and egg-collecting stations to supply 1,500,000 trout for distribution in southern California counties.

BEAR LAKE HATCHERY.

On March 4 a crew of men left for San Bernardino en route to the Bear Lake Hatchery. Every effort will be made to collect a large number of rainbow trout eggs at the North Creek spawning station. During the past summer and fall extensive repairs and improvements were made at the North Creek station and with the new thirty-trough hatchery at that point we will be able to handle a much larger number of eggs than in former seasons.

TAHOE HATCHERIES.

Arrangements have been made to open the Tahoe Hatchery on March 18 or 19 and plans have been made to take the usual number of eggs from the black-spotted trout of Lake Tahoe.

WAWONA HATCHERY.

A lease has been obtained from the Wawona Hotel Company, and contract has been let for the construction of a small, modern hatchery. Unless this work is delayed by a heavy fall of snow, the hatchery will be ready for operation during the fore part of April, and 250,000 trout eggs will be shipped to that station, and the resulting fry distributed in the streams of Mariposa and Madera counties.

ALMANOR AND DOMINGO SPRINGS HATCHERIES.

Arrangements have been made to send a crew of men into Plumas County to open up the Almanor and Domingo Springs hatcheries on March 11. All repair and improvement work was completed at these stations last fall, after the completion of the fish distribution operations, and everything is therefore in readiness for this season's operations.

FORT SEWARD HATCHERY.

In addition to 200,000 quinnat salmon eggs taken at the Bryans Rest Station on Eel River, Humboldt County, approximately 80,000 quinnat salmon were shipped to the Fort Seward Hatchery from the Mount Shasta Hatchery. The fry resulting from these eggs are doing nicely and will soon be ready for distribution. As the fry reach the proper stage, they will be distributed in the Eel River and tributaries and other streams in Humboldt County.

Fig. 53. Quinnat salmon taken at Bryan's Rest Egg Collecting Station on Eel River, Humboldt County. Photograph by S. Campbell.

SNOW MOUNTAIN STATION.

The Snow Mountain station was opened during the fore part of January. Owing to extreme drought, the spawning steelhead have not ascended Eel River as far as Cape Horn dam, at which point our egg collecting station is located, in any considerable numbers, and therefore the collection of eggs has been very much delayed. However, should there be sufficient rainfall during the coming month, we will undoubtedly be able to obtain an ample supply of steelhead trout eggs at this station.

BROOKDALE AND SCOTT CREEK STATIONS.

The same climatic conditions have obtained in Santa Cruz County as at the Snow Mountain station, and the collection of steelhead trout eggs at the Scott Creek station has been very small. Only a little over 300,000 eggs have been collected to date. However, our assistants report that there are large numbers of spawning trout at the mouth of Scott

Creek, and that the first storms will in all probability bring them up to our station. We anticipate collecting the usual number of eggs at this hatchery.

SCREEN AND FISHWAY SURVEYS.

A number of new surveys for fish ladders have been made during the winter in Santa Cruz, Siskiyou and Mariposa counties. New notices to install screens have been served during the past six months on nearly every ditch owner in the state who has not heretofore installed suitable screens. Among the more important screens which have been installed during the past winter are those of the Northern California Power Company, in Shasta and Tehama counties. The commission has been endeavoring since 1912 to have the large canals of this company properly screened, but it was not until the last couple of months that our efforts were successful. The screens installed are, with one exception, of the Southern California Edison type and are of first class construction.

The Anderson-Cottonwood Irrigation Project is at the present time constructing a three-unit screen, each unit of which will be 12 feet 5 inches in diameter and 9 feet long. This installation is also of the Southern California Edison type. The construction of the screen will be completed before the water is turned into the canal.

The Stanford University Vina Ranch has let contracts for the construction and installation of the new type of Rogue automatic cleaning screens for all of their ditches.

COMMERCIAL FISHERY NOTES.

N. B. SCOFIELD, Editor.

ADDITIONAL INFORMATION ON HERRING.

There is a great mass of literature on the herring fisheries and on the life history of the Atlantic herring but very little has been published on the Pacific herring. Those interested may find the spawning habits of the Pacific herring described in a paper by Dr. C. M. Frazer, published by the Biological Board of Canada (University of Toronto Press, 1916).

For information as to what the scope of a fisheries investigation should be, read "A Contribution to the Life History of the Pacific Herring: Its Bearing on the Condition and Future of the Fishery," by W. F. Thompson, in the Report of the Commissioner of Fisheries, British Columbia, for 1916.

A full description of the Scotch method of curing herring may be obtained from the United States Bureau of Fisheries, Washington, D. C.

SHAD SEASON APPROACHING.

The herring season has about come to a close and the shad, a near relative, will take its place. People will continue to talk of the high cost of fish, and of bones, and the shad taken in California will continue to travel across the continent to those who appreciate a good fish.

FRESH SARDINES NOT APPRECIATED.

The California sardine is a splendid fish to fry in the pan, and is abundant and cheap. During what has been termed the "fish famine" of the past winter, sardines could have been obtained almost without limit, but, except as a canned product, there was no sale for them.

CLAMOR FOR STURGEON.

Whereas the sardine catch in California is over one hundred million pounds annually, there is a clamor for the removal of fishing restrictions from the now nearly extinct sturgeon.

SALMON CATCH IN 1917.

The catch of salmon on the Sacramento and San Joaquin rivers, including San Francisco Bay, from January to December, 1917, inclusive, was 7,219,846 pounds.

The catch of salmon on Monterey Bay for the same year was 3,981,670 pounds.

PATROL BOAT "ALBACORE" BUSY.

The fish and Game Commission's new patrol boat "Albacore" is now in commission, and under Captain H. B. Nidever will take care of the fisheries and kelp patrol work, and lend assistance in the investigation work being carried on by the commission. The boat's headquarters will be at Long Beach and its territory will be the state waters from Ventura to San Diego.

ANCHOVIES WILL BE SALTED.

Santiago Briones, Inc., fish packers of New York, have established a plant at Monterey and are preparing to put up salt anchovies on a large scale. The fish will be packed in 5-, 14- and 28-pound cans.

THE ANCHOVY A FINE FOOD FISH.

The anchovy is one of our best food fishes and is delicious fried in olive oil or butter. It is found along our shores the year round in immense numbers and the markets could sell it very cheaply if the public would use it.

MACKEREL DELICIOUS BUT SELDOM EATEN.

The coast of California for a good part of the year swarms with mackerel. They are found close to shore, where any one may easily catch them. They are food fish of the highest quality, but the fishermen do not catch them, for they can not sell them.

TUNA INVESTIGATIONS.

The Fish and Game Commission in its investigation of the tuna, under the supervision of Mr. W. F. Thompson, has added several assistants in order that the work may be hurried along. A laboratory has been opened at Long Beach in close proximity to the tuna canneries in order to facilitate the gathering of data and the handling of cannery statistics. The scope of the work has been extended in order to include the sardine and herring.

The objects of this investigation work are to establish a basis on which the future of the fisheries may be judged and to determine if they show evidence of depletion, also to assist in the more rapid development of the fisheries. The work has been well organized along the lines of similar investigations in Europe and with the intention of continuing it indefinitely.

The commission is co-operating with tuna packers in carrying on experimental fishing on rather a large scale. Two well trained Japanese fisheries experts are employed and already we feel assured that new methods of tuna fishing can be profitably introduced and the fishing season considerably extended.

BETTER FISHING METHODS NEEDED.

The meatless days and the high price of meats have increased the consumption of fresh and canned fish throughout the state, but there has been no material increase in the consumption of salt or smoked fish. During the winter months the fishermen have not been able to supply the public with the species that are more commonly used fresh, such as California halibut, salmon, striped bass, sand dabs, sole and rock cod. The reason for the shortage of fresh fish this winter was due mostly to the inefficient fishing methods employed, which proved inadequate to supply the increased demand during what is termed the "off season" for fish. The shortage of fish in northern California was caused mostly by the poor catches of the trawl or paranzella nets, which failed when most needed.

Three years ago the editor of this department read a paper before the Pacific Fisheries Society in which he had the following to say about improved methods and the future of trawl fishing in California:

> "As to the future of trawl fishing in California, it is safe to say the otter trawl will in time be adopted, for it can be operated more economically and will do better work. It can be operated at night and the fish landed fresh for the morning market. The paranzella can not very well work at night. The otter trawl can work in much deeper water, thus greatly extending the fishing area. It can work near submerged rocks and close to rough bottom by virtue of the fact that the net follows directly behind the boat and by taking soundings the rocks or rough bottoms are detected before the net reaches them and the course can be altered or the net raised. By fishing adjacent to rough bottom the trawl will catch a greater variety of fish. It can work in the stormy weather of winter when the fish bring a good price. The boats would be larger and

more seaworthy and have better accommodations for the crew. They have room to clean and ice the fish at sea and on that account can make a longer trip. An otter trawl of a size sufficient to do the work of one of the San Francisco paranzella outfits could be operated at two-thirds the expense.

"California will never be the home of a great trawling industry, for the trawl fishing grounds are too limited. On account of the rapid deepening of the ocean floor to the west of the continent, the bottom suitable for trawling is a very narrow strip. This strip extends from Point Concepcion to our northern boundary, but only in two or three places will it exceed five miles in width and most of it is one to three miles wide. Otter trawls from San Francisco could fish this entire distance if the market would take the fish. The three San Francisco paranzella outfits and the four smaller outfits at Santa Cruz, with their comparatively primitive methods, can for the most of the year easily over-supply the market. By adopting the improved methods of handling fish, in use elsewhere, interior markets could be reached. But our people are not fish eaters and unless the public takes more kindly to a fish diet, our trawling grounds will be sufficient for many years to come, as in the past forty years they have been only scratched in two or three places."

THE GOVERNMENT CONTROL OF FISHERIES.

Some apprehension has been felt in regard to the announcement issued from Washington that the government was to take over the control of the fisheries and remove fishing restrictions. On February 10, the United States Food Administrator for California issued the following:

"San Francisco, Feb. 10, 1918.—Attention of salt water fishermen throughout California was called today to the following statement issued by the United States Food Administration at Washington warning fishermen regarding procuring of licenses to do business:

"Under a recent proclamation of the President, the second issued by him on control of the fish industry, salt water fishermen, generally, must be licensed by the Food Administration. By the first proclamation, effective November 1, 1917, it was made compulsory for all wholesale fish distributors, brokers and commission men to secure licenses; but those catching fish were not included unless they were also in one of the classes named. By the new proclamation of January 10, 1918, 'all salt water fishermen, whether fishing independently or on shares,' must secure licenses if 'engaged at any period of the year in the commercial distribution including catching or selling, of any or all varieties of salt water fish, including menhaden, and of shellfish and crustaceans.'

"These licenses must be secured on or before February 15, 1918, and are issued without charge or fee of any kind. The term 'salt water fishermen' includes all (except those employed for wages only, without a share in the proceeds) who are engaged in catching salt water fish or producing any other kind of sea food, including lobsters, crabs, shrimps, oysters, clams, etc. Also any person, firm, corporation or association engaged in production and employing any such fisherman or producer of sea food, whether for wages or on shares or both, must take out a license. These licenses can be secured from the Licensing Division of the Food Administration at Washington.

"This license system, as applied to the fisherman, is wholly for their benefit, not to affect their prices, not to limit their operations, but to extend them and to remove local restrictions that now prevent free and full development of sea-food production.

"The Food Administration does not intend to regulate the prices of fish and sea foods in the fishing districts; and distribution and prices, so far as fishermen and producers are concerned, will move along natural lines as before.

"By assuming this more direct control of salt water fishermen, the Food Administration will be able, where necessary, to supersede state laws and local restrictions by general regulations which will allow increased opportunity to fishermen and broaden their operations during the war. These local restrictions have discouraged fishermen, lessened their catches and limited the use of their most productive gear; nonresidents and aliens have been prevented from fishing in waters of certain states; closed seasons have been enforced on certain varieties of fish during their period of greatest abundance, and restrictions upon the use of purse seines have prevented utilization of this effective gear within the three mile limit. These and other restrictions on fishing have curtailed production and brought about a shortage in supplies of salt water fish when we need sea food more than ever before. These restrictions will be removed or modified under the new regulations, and this greater freedom for fishermen, with other measures for the benefit of the fish industry, should largely increase the supply of sea food by spring of 1918.

"At the same time, due regard will be paid by the Food Administration to any present restrictions that are vitally necessary to protect the fish supply of the future, and to prevent extinction or too great reduction in the number of any species valuable for food."

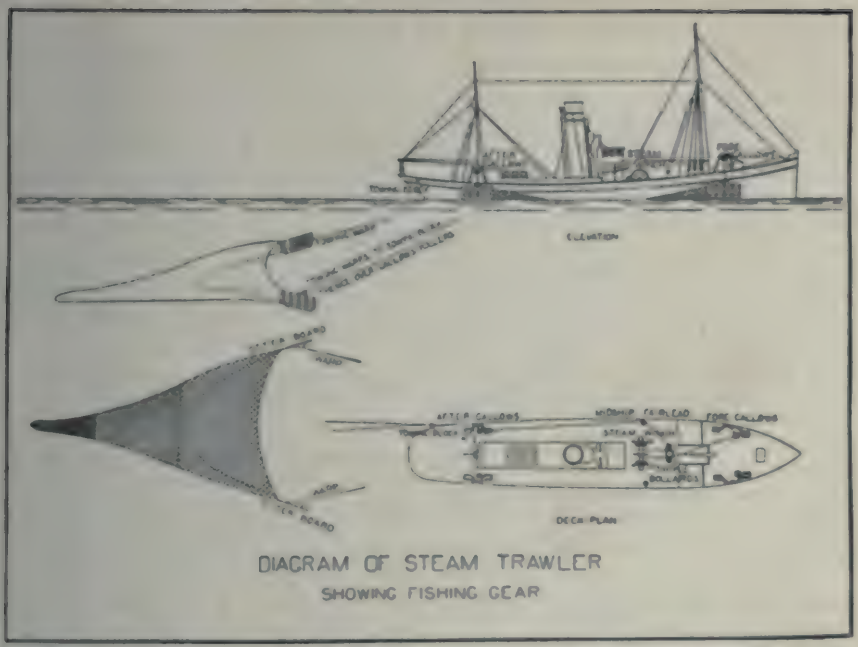

Fig. 4. Diagram showing steam trawler and otter trawl. Apparatus of this kind would supply San Francisco and nearby cities with fresh fish daily. (From United States Bureau of Fisheries, Document No. 816, p. 19.)

Later the California Food Administrator appointed a Fish Administrator for southern California, Mr. W. C. Crandall of the Scripps Institute, and on March 2, a conference was held at the Food Administrator's office at which were present representatives of the United States Bureau of Fisheries and the State Fish and Game Commission. After considerable discussion following a report by Mr. Crandall on conditions in southern California, it was determined that the state laws in the main do not prevent the full development of the fisheries. The restrictions on sea fishing which prevent the use of effective fishing gear, as condemned in the proclamation of the Federal Food Administrator, does not apply to California as it does to many other states. It is only in minor instances of a local character that restrictions need to be removed or modified. The Fish and Game Commission, or the governor of the state, do not have the power to set aside regulations passed by the legislature so that the opportunity to modify existing regulations or to issue new ones to meet rapidly changing conditions, is welcomed by the state.

The few changes in the state laws as indicated on page 80 were decided upon.

The State Food Administrator expressed himself as opposed to removing fishing restrictions from the species of fish that are being caught to the limit in this state at present, such as salmon, shad, striped bass and California halibut, while there are plenty of other good fish the people can use.

It was brought out at the conference that the salt water fishing boats and fishing gear are inadequate to meet the present emergency. This is especially true with regard to the trawl nets and rock cod or long-line boats. We need otter trawls of good size and larger long-line boats with power gurdies for working more lines and at greater depths. It was also brought out that we have many good species of fish which could be furnished the people in large quantities if they can only be induced to use them.

CONSERVATION IN OTHER STATES.

OCEAN FISH REFUGES.

The Bureau of Fisheries is placing subway stone and other refuse to a depth of eighteen inches, from Romer Shoals to Long Beach, New York. The ocean floor here is a hard, sandy bottom, and the rock piles will attract marine animal life upon which fishes feed. Captain J. Klein of Bergen Beach has experimented for many years with ocean rock piles, and in one area containing 300 square feet of such dumpings in 66 days of fishing two men, using hook and line, took seventeen tons of fish. This convinced Dr. H. F. Moore of the United States Bureau of Fisheries that such feeding grounds were worth making on a larger scale, and if the Romer Shoals-Long Beach newly made grounds produce results the idea will be applied elsewhere.—*The American Angler*, August, 1917.

FISH AND GAME ADMINISTRATION IN WASHINGTON.

The Fish Commission of Washington is made up of the state fish commissioner, the governor and the state treasurer.

In the state the county unit is most important in fish and game legislation. The fish commissioner and state game warden act in an advisory capacity to the various county fish and game commissions. The state receives 20 per cent of the fund from the sale of licenses, while the remaining 80 per cent is expended by the various counties.

WASHINGTON'S GAME REFUGES.

Instead of setting aside large areas as game refuges, the state of Washington creates refuges for wild fowl by preventing the killing of all waterfowl on the Columbia or Snake rivers or within a quarter of a mile of the shores thereof throughout several counties. This provides a safe breeding place and a sanctuary for many waterfowl.

NO INCREASE OF BOUNTIES IN PENNSYLVANIA.

The governor of Pennsylvania recently vetoed a bill providing for increased bounties on wildcats and weasels. His excuse for so doing is as follows:

1. Uneconomic conditions would be produced owing to the fact that idle and irresponsible persons are incited to waste time in the woods.

2. It would cause unnecessary drain on hunters' license funds. Noxious animals are, as a rule, overrated in their destructiveness. Nature's balancing of life, undisturbed by man, is, on the whole, wise and good.

In spite of forcible arguments advanced, many sportsmen in Pennsylvania are disappointed in the failure of the bounty bill to become a law.

$15,000 FINE PAID FOR TRAPPING WILD DUCKS.

A check for $15,000 from Henry C. Phipps, in settlement of a case against him for illegally trapping wild ducks upon his estate at Wantagh, Long Island, has been received by Conservation Commissioner George D. Pratt of New York. This is the second largest fine in a game case ever obtained by the commission, the largest having been for $20,000 for illegal sale of wild ducks in 1913.

The case began with a raid by Chief Protector Llewellyn Legge and a corps of game protectors upon Mr. Phipps' estate at Wantagh on February 20, when 442 live wild black ducks, 25 dead wild black ducks, 5 pintails and 1 wood duck were seized. A court of investigation was held the same day.—*Bull. Amer. Game Prot. Assn.*, May 1, 1917.

DOVE PROTECTION IN TEXAS.

At the last session of the Texas legislature a bill was passed extending for two months the open season during which doves may be killed. The main reason advanced why this change ought to be made was that sportsmen of north Texas were deprived of the sport of killing these useful birds and that the south Texas gunners got the best of the dove shooting. Because many farmers and others were opposed to changing the open season for doves to suit the convenience of some sportsmen, they were criticized and ridiculed, their motives impugned, their statements misquoted and misrepresented, and themselves contemptuously referred to as "silly sentimentalists," "extremists," "hayseeds," "bird cranks," etc., by many of those who proposed and advocated the amendment.

Many of the best sportsmen who are in favor of reasonable protection, with a view to preserving this valuable little game bird and preventing its extermination, are not in favor of commencing dove shooting in September, for the reason that doves are not through with their nesting season at that time of the year. In some parts of this state doves nest all through July and August; their eggs are frequently found in September, and occasionally as late as the middle of October.—H. P. Attwater.

PENALTIES FOR VIOLATION OF OREGON GAME LAWS.

The following interesting penalties are imposed upon the violators of game laws in Oregon:

"Any person killing any mountain sheep, mountain goat, antelope, elk, or moose, may be fined from $200 to $1,000 and imprisoned not less than sixty days nor more than six months."

"Besides fines, any one violating laws could be subject to a civil liability ranging from $2 for each game bird to $200 for elk and mountain sheep; shall forfeit all guns, dogs, boats, traps, fishing apparatus and implements used in violation of laws, and shall forfeit his hunting license for the balance of the calendar year in which the offense was committed."

NEVADA PROHIBITS DEER HUNTING WITH AID OF DOGS.

Although both California and Oregon place certain restrictions upon hunting of deer with dogs, a provision of the Nevada law states:

"Sec. 46. It shall be unlawful for any person or persons, firm, company, corporation, or association, at any time of the year to hunt, chase, pursue, catch or kill, any deer, antelope, caribou, elk, mountain sheep, or mountain goat, with or by the use or aid of any hound or hounds."

Another interesting provision of the Nevada law is that which protects the American eagle. The law states:

"Sec. 56. It shall be unlawful for any person or persons, firm, company, corporation or association to kill, destroy, wound, trap, injure, keep in captivity, or in any other manner to catch or capture, or to pursue with such intent the bird known as the American eagle, or to take, injure or destroy the nest or eggs of said before-mentioned bird."

VALUE OF WILD LIFE ENORMOUS.

Reduced to statistics the annual value of wild life assets of the state of Minnesota, after careful investigation and inquiry, are estimated as follows:

Food value of game and fish	$2,000,000
Furs, skins and pelts	1,300,000
Value of tourist trade	1,500,000
Value of commerce depending upon game and fish	3,000,000
Value to agriculture of insectivorous birds	2,500,000
Total	$10,300,000

Every effort has been made to make this estimate conservative, and doubtless some of the items should be much larger. —*Fins, Feathers and Fur*, December, 1916.

MINNESOTA COMMISSION REMODELS FISH AND GAME LAWS.

A commission created by the last Minnesota legislature is remodeling the fish and game laws of that state. The work of the commission will be to make a thorough study of the provisions of the laws governing fish and game and to revise and simplify them, striking out those laws which are ambiguous and conflicting.

A SUCCESSFUL SPARROW CAMPAIGN.

The Davenport Bird Club of Davenport, Iowa, has almost wiped out English sparrows in that city. Poisoned grain in the form of cracked corn and wheat screenings coated with strychnine-poisoned starch was used. After two months a careful count disclosed a reduction of 95% in the sparrows feeding in the streets. The club estimates that about 150,000 sparrows were destroyed during the winter. As far as is known only two or three native birds were poisoned.—*Current Items of Interest*, October 26, 1917.

NEW YORK HAS CONSERVATION SCHOOL.

The New York legislature has appropriated $15,000 for a game farm to be conducted as a part of the New York State College of Agriculture at Ithaca, New York. The administration of the farm is in the hands of the trustees of Cornell University, who will cooperate with the New York Conservation Commission. Instruction will be along educational and experimental lines.

BIRD PRESERVES IN RUSSIA.

Although birds receive little legal protection in Russia, there have been established a few sanctuaries. One of these has been established in Caucasia for the protection of the francolin and several for sibelines have been created in Siberia by the Russian Department of Agriculture, the largest of these comprising an area of 50 by 45 miles, or 2,250 square miles. The protection of birds in the parks of Kharkow is planned by a newly formed "Commission for the Protection of Birds" of that town.—*Current Items of Interest*, June 25, 1917.

GOULD LEAGUE OR BIRD LOVERS IN AUSTRALIA.

The Gould League of Bird Lovers, the bird-protection organization of Australia, continues to grow, having a membership of 60,000 (mostly school children) in Victoria alone. It is taking up the plan of supplying state school grounds, parks, and public gardens with nesting boxes, food-tables, and bathing pools for the birds.—*Current Items of Interest*, June 25, 1917.

ARKANSAS REFORMS.

In the recent game bill enacted by the Arkansas legislature, all seines and nets are eliminated from use by market fishermen except stationed hoop nets with limited wings, the meshes of which must not be less than three inches square. The seasons on migratory birds were made to conform with the federal regulations, so there is to be no more spring shooting in Arkansas. Only rabbits and squirrels may be sold. It is illegal to sell other game in the state or to ship it out to a market. Market hunting is dead in Arkansas. Bag limits in the state are twenty-five ducks and fifteen quail in a day, two deer, four turkeys and one bear in a season.—*Wild Life*, September, 1917.

LOUISIANA OPPOSES SUSPENSION OF GAME LAWS.

Conservationists have had to fight the move to suspend all laws protecting game birds "as a war measure." Commissioner Pratt of New York was the first one to set right misguided enthusiasts on the subject. Commissioner Alexander of Louisiana has also opposed any move to allow a greater amount of hunting. He shows that the proposed action would undo the work of years and would not lower the price of meat a single cent. The point is also made that Louisiana is host to almost 75 per cent of the migratory waterfowl during the winter season and hence there is thrust upon her an obligation of guardianship which can not be ignored.

LIFE HISTORY NOTES.

COYOTE KILLS QUAIL.

During the early part of October, 1917, Deputy T. K. Duncan and myself were going down Marsh Creek, in Contra Costa County. Near the oil pumping station, just at break of day, we flushed some quail from a creek bottom. These birds flew across the road as if greatly frightened. In a moment a large coyote appeared, but a few feet from us, carrying in his mouth a valley quail. Evidently the coyote is an enemy of quail, as well as an enemy of other game.—M. S. Clark.

HUNGARIAN PARTRIDGES SEEN IN INYO COUNTY IN 1913.

In July, 1913, I saw about a dozen Hungarian partridges on the Walter's ranch, near Independence, Inyo County, evidently part of the birds planted in the vicinity. The following spring two old ones were seen, but since that time the birds have absolutely disappeared.—J. J. Singlau.

"VARMINT" DOGS CLEAN OUT BOBCATS.

Last winter, with the use of "varmint" dogs "Tennessee Coon Hounds," we treed and shot out twenty wildcats, and all of these up to the time of spring lambing had deer meat in their stomachs, and as lambing came on some had lambs' meat and wool in their intestines. This winter we have caught five already and all full of venison but one, and this one had a fill of rats and mice. It seems only just and fair to all concerned that a bounty, say

of $2.50, be placed on them. This would give trappers more inducement to rid the country of this pest. I keep the dogs for my own protection and at no small expense, but feel this the best insurance my stock can have. It is sure some sport to follow the dogs and at the end of from thirty minutes, sometimes only ten, up to two and a half hours, to find yourself looking up at a very nervous cat in a tree.—C. H. Cooley.

Fig. 55. Freak antlers of black-tailed deer killed near Mount Hamilton, September 10, 1918. According to law this deer was unlawful game in that it lacked branched antlers. Photograph by W. N. Dirks.

ADULT DEER WITH UNBRANCHED HORNS.

A freak deer was killed near Mount Hamilton, September 10, 1917. This deer was apparently an old stag and weighed close to 150 pounds. The antlers, however, were unbranched in spite of the fact that they were much longer than any normal pair (see fig. 55). The law definitely states that the killing of such deer is a violation. Deer of this sort are so rare that the hunter loses nothing, the supply of deer is augmented, and the law more easily enforced when such animals are not killed.—W. N. Dirks.

SWANS RARE THIS YEAR.

Proof of the oft-quoted statement that swans are driven south during severe weather is to be found in the lack of birds of this species during the past winter, which has been an unusually open one. Last season a mile or two of water northwest of the Marysville Buttes was covered with swans. This year in the same place not over twenty birds have been seen on this body of water. As swans nearly always loaf in the same situation, these birds could be expected in this locality had they come south into California. —Geo. Neale.

UNITED STATES FOREST SERVICE CO-OPERATION.

FOREST FIRE KILLS FISH.

Ranger Robert Finley, who is in charge of the trail crew, reports that in places at the head of Arroyo Seco in the Monterey National Forest where fires occurred last summer the rains have washed so much hardwood ashes into the creeks that the fish have been killed.—H. G. Merrill.

ANTELOPE IN MODOC COUNTY

A small bunch of antelope range on the plateau country north of Alturas and although local opinion is much divided as to their number, I have heard of but one man who had seen over a dozen head. This man claimed to have counted seventeen.—Wm. S. Brown.

MOUNTAIN QUAIL SCARCE IN TRINITY COUNTY.

A general scarcity of mountain quail is reported in the Trinity National Forest, except at the lower elevations along the Trinity River. This condition is attributed mainly to the heavy snows of the past season, which prevented them from securing the usual amount of food. After the storm numbers of dead birds were found along the trails and roads in our region. The coyote is also responsible for a heavy annual loss, as it is a well-established fact that great destruction, especially to the young, is due to these animals.—E. V. Jotter.

REPORTS.

CALIFORNIA FISHERY PRODUCTS, OCTOBER, NOVEMBER AND DECEMBER, 1917.

Species of fish	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Solano, Yolo	Sacramento, San Joaquin	Alameda, Contra Costa	San Francisco	Santa Cruz	Monterey	San Luis Obispo, Santa Bar-bara, Ventura	Los Angeles	Orange	San Diego	Imperial	Merced	Total
Albacore										5,601	1,409,621	202	397,382			1,812,206
Anchovy							8,612		47,925		45					56,582
Barracuda										27,102	221,463		245,435		54,065	548,065
Bonito								249		1,580	372,386		283,643			773,857
Bocaccio							11,264	67,981	341,043							420,288
Bluefish							26,017	271	8,182							34,470
Chilipepper							46,109	136,997	108,405							295,471
Carp		317		1,801	12,311	9,406	2,392									26,227
Catfish		24,765		6,689	6,750	734										38,938
Codfish							2,689	1,467	1,897		2,664					7,267
Cultus cod	81						161,293	14,993	210,900							387,117
Dogfish						225	168,972	318	242		4,161		6,379			180,299
Flounder	693		63	453			70,645	67,675			617					140,443
Halibut	654						4,451	1,197	526	45,786	175,676		231,300		223,160	811,220
Hake							51,892	18,000			3,893		695			74,580
Hardhead					13,526	2,957										16,483
Herring	2,300		161,339				80,349				425					244,413
Kingfish							4,641	4,880	6,776		104,531		9,704			130,734
Mackerel							305		353,923		798,392	746	123,124		5,775	1,282,265
Mullet														17,482		17,482
Pike				12	841	1,420	22									2,295
Pompano							28				2,718					2,746
Perch	956	130	11,488			8	28,597	225	2,634		12,468	148	124			57,118
Rock bass											149,661		20,891			170,585
Rockfish	3,182						467,212	155,121	374,257	17,660	390,597	2,750	197,713		1,695	1,610,186
Sole						58	2,196,449	447,747	2,849		10,891		5,899			2,663,893
Salmon	1,274,973	109	479	5,553	799	4,707	149		225		492					1,287,446
Smelt	2,315	50	10,070				9,183	8,892	9,143	31,974	89,241	109,398	99,545		779	360,490

Sea bass (white)			70				420			5,114	19,843		7,998		6,110	39,884
Sea bass (black)										284	39,075		28,495		5,229	73,615
Sand dab							379,040	239,973	22		4,805					623,840
Striped bass			102		79,030	94,512	14,402									187,946
Shad				2,458	24	6,544	1,528									10,744
Sardine			2,472				117,172	1,150	16,807,822		18,120,252		4,097,208			34,778,796
Skate							79,525		263							79,788
Smelt							50		100		10,224					10,374
Sea trout											26					26
Trout cod							5,370									5,370
Trout (lake)								267								267
Trout (steelhead)	18,611															18,611
Turbot			40													40
Whitefish			2,014				2,237									4,251
Yellowtail								105,701	18,157	1,078	560,493		310,907		5,080	1,001,416
Miscellaneous			4,049		304		78,119		2,556	2,892	14,783		4,393			107,016
Totals	1,303,775	25,371	102,707	17,106	105,465	120,371	4,020,433	1,272,891	15,357,203	151,056	17,330,948	173,211	6,810,117	17,892	306,573	50,407,404
Crustaceans—																
Crab (shore)	727						34,302	280	108							35,487
Spiny lobster										26,259	42,243	3,224	131,558		62,746	266,330
Shrimp							162,301									162,301
Turtle													170		330	500
Total																464,818
Mollusks—																
Squid									12,040							12,040
Cuttlefish							4,945	2,715	5,243		5					12,908
Clam (Pismo)										220,080						220,080
Clam (cockle)			6,301								5,747					11,248
Clam (softshell)		1,595	37,295				2,906									42,520
Clam (mussel)	11,300	270	377,681					1,374		57		1,400				32,732
Oyster (cocid) No.							621,835									621,835
Abalone		1,583							148,014	21,058						170,255
Mussels	160						2,707			2,405	5,809	500				11,071
Total																1,145,417

VIOLATIONS OF FISH AND GAME LAWS.

November 1, 1917, to February 1, 1918.

Offense	Number of arrests	Fines imposed
Game.		
Hunting without license	54	$825 00
Failure to produce license on demand	1	
Deer, close season, killing or possession	4	100 00
Female deer and fawns, killing or possession	3	100 00
Deer meat, close season, possession	7	100 00
Deer horns and skins, failure to produce	1	50 00
Quail, close season, killing or possession	3	75 00
Ducks, possession or shipping excess bag limit	6	50 00
Geese, possession or shipping excess bag limit	2	
Brant, possession or shipping excess bag limit	2	
Doves, close season, killing or possession	1	50 00
Grouse, close season, killing or possession	1	25 00
Wild pigeon, close season, killing or possession	5	100 00
Tree squirrels, close season, killing or possession	2	50 00
Nongame birds, close season, killing or possession	22	281 00
Shore-birds, close season, killing or possession	4	100 00
Taking song-birds with net	5	200 00
Night hunting	37	575 00
Shooting from power boat while in motion	5	60 00
Shooting at pheasants	2	25 00
Selling wild game without a license	3	20 00
Offering Bird of Paradise for sale	1	15 00
Possession mountain sheep heads and hides	2	100 00
Using an animal blind	1	25 00
Trapping fur-bearing mammals without a license	2	20 00
Total game violations	176	$2,946 00
Fish.		
Angling without license	10	$190 00
Fishing for profit without license	14	65 00
Trout, close season, taking or possession	7	105 00
Trout, taking other than by hook and line	1	
Trout, excess bag limit	2	50 00
Salmon, Saturday and Sunday fishing, taking other than by hook and line	8	650 00
Spot fin croaker, offering for sale, close season	1	10 00
Catfish, offering for sale, undersize	1	20 00
Halibut, offering for sale, underweight	2	30 00
Abalones, close season, taking or possession, undersize, drying	40	800 00
Crabs, female, undersize	5	30 00
Clams, undersize, excess bag limit	11	350 00
Lobsters, undersize	5	90 00
Illegal fishing apparatus	11	300 00
Dynamiting fish	2	
Dried shrimps, possession	1	
Total fish violations	121	$2,840 00
Grand total fish and game violations	297	$5,786 00

SEIZURES—FISH, GAME AND ILLEGALLY USED FISHING APPARATUS.

November 1, 1917, to February 1, 1918.

Game.

Ducks	2,242	
Geese	815	
Brant	222	
Quail	89	
Doves	2	
Pheasants	100	
Wild pigeon	3	
Rabbits	51	
Sparrows	779	
Nongame birds	27	
Song birds	344	
Deer meat	216	pounds
Bird nets	2	

Fish.

Striped bass	5,644	pounds
Salmon	3,967	pounds
Trout	100½	pounds
Black bass	9	pounds
Catfish	27½	pounds
Halibut	250	pounds
Spot-fin croaker	30	pounds
Crabs	187	
Clams	1,972	
Abalones	1,454	
Abalones (dried)	197	
Lobsters	30	
Lobsters	37	pounds
Dried shrimp shells	500	pounds
Miscellaneous fish	21	pounds
Nets, traps and fishing outfits	27	

Searches.

Illegal fish and game	27

STATEMENT OF EXPENDITURES FOR THE MONTHS OF OCTOBER, NOVEMBER AND DECEMBER, 1917.

	October	November	December
General Administration.			
General administration	$1,977 46	$1,580 92	$1 667 49
Research, publicity and education	266 23	215 [illegible]	196 34
Printing		1,172 91	92 23
Fish exhibits	42 93	28 90	
Game exhibits	7 75		
Game farm	263 01	316 49	243 80
Mountain lion bounties	290 00	200 00	320 00
Lithographing hunting licenses			
Lithographing angler's licenses			965 00
Hunting licenses, commission and refunds	2,273 70	964 25	1,799 40
Angler's licenses, commission and refunds	742 70	1,214 15	1,495 90
Market fishing licenses, commission and refunds	48 50	92 00	92 50
Paper Mill Creek Dam	236 57		
Totals	$5,940 65	$5,852 38	$5,729 46
Patrol.			
San Francisco district	$5,740 54	$5,626 31	$5,200 37
Sacramento district	4 015 22	3,719 19	3 994 09
Los Angeles district	2,518 90	2,502 90	2,502 33
Launch patrol	369 73	836 80	1,527 70
Prosecutions fish and game	182 25	218 40	174 55
Crawfish inspection	206 78		
Winter game feeding			
Accident and death claims	250 80	200 64	200 64
Totals	$13,684 22	$13,125 33	$13,701 68
Department of Fish Culture.			
Hatchery administration	$806 64	$813 94	$760 98
Mount Shasta Hatchery	1,315 54	1,302 72	1 774 38
Klamath Station		8 40	125 00
Mount Whitney Hatchery	1,302 56	766 24	970 65
Rae Lakes Station	34 00		
Cottonwood Lakes Station			
Tahoe Hatchery	206 65	45 49	5 00
Tallac Hatchery	5 00	5 00	5 00
Markett Lake-Carson Hatchery			
Fort Seward Hatchery	820 03	602 34	505 38
Ukiah Hatchery			
Snow Mountain Station			6 75
Brookdale Hatchery	77 35	71 53	161 90
Scott Creek Station	31 00	30 00	31 00
Almanor Station	16 85	5 00	5 00
Domingo Springs Station	52 14	17 20	9 00
Bear Lake Hatchery	421 14	555 98	246 50
Wawona Hatchery			
Yuba City Station			
Fish distribution	1,316 70	372 05	78 80
Fish transplanting	281 41	408 71	
Screen, fishway and water pollution	347 75	587 80	567 92
Special field patrol	222 82	276 78	61 10
Totals	$7,261 10	$5,868 17	$5,056 15
Commercial Fisheries Research and Patrol.			
Fishery research and patrol	$1,123 82	$1,379 89	$1,136 42
Grand totals	$27,929 79	$26,225 92	$25,703 71
Department Engineering Launch "Albacore"		1,482 04	

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CALIFORNIA FISH AND GAME

"CONSERVATION OF WILD LIFE THROUGH EDUCATION"

Volume 4 SACRAMENTO, JULY, 1918 Number 3

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A REVIEW OF THE KELP INDUSTRY.

By W. C. CRANDALL.

In the year 1910, the Bureau of Soils of the United States Department of Agriculture, called the attention of the public to the giant kelps lining much of the west coast of America. New requirements for fertilizers and an extending market had caused the Bureau of Soils to look for other sources of supply, and from information at hand at that time, it seemed that the giant kelps might prove to be such a source. More intensive study of the plant and the extent of its distribution confirmed the idea, and consequently a great industry is being developed.

The giant kelps along the coast of California are of three general types. The one more widely distributed and greatest in quantity is the *Macrocystis pyrifera* or ribbon-kelp. Plants of this species varying

from 25 to 100 feet in depth below the water, are found in beds along the shore where rocky ledges or loose rocks abound and to which the plants attach themselves by means of holdfasts. These beds occur usually in exposed places where the wave action is pronounced.

The plant itself consists of a holdfast or root-like structure which attaches itself to rocks at the bottom; stipes or stems, unbranched, which grow up from this holdfast until they, sooner or later, reach and spread out upon the surface of the water; and lamina or leaves which occur at intervals along the stipes, the intervals varying from 2 to 3 feet near the holdfast to a slight space near the growing end. The terminal leaf of the growing stem splits, a new terminal leaf forms and splits, and as the process continues, lamina along the stipe are increased; while by the elongation of the distance between lamina the total length of the stipe is increased.

The plant reproduces itself by means of spores which are developed in spore bodies located, usually, on leaves near the holdfast, although they are occasionally found on leaves near the tip of the plant. In this regard, Dr. R. P. Brandt, Botanist of the Scripps Institution, will soon be ready to publish some interesting observations made by him in his recent studies of *Macrocystis pyrifera*.

The beds of *Macrocystis* with which the California kelp industry is concerned extend along the coast from San Diego to Point Concepcion and about the islands offshore. During the last year the beds from San Diego to San Juan Point and about San Clemente, San Nicholas and Santa Barbara Islands were used by the Hercules Company, Swift & Company, and numerous handpickers; the beds about Long Beach and Wilmington were used by the Diamond Match Company, the Pacific Products Company, and the Sea Products Company; while in the Summerland region, the United States Experimental Plant, the Lorned Manufacturing Company, and the California Chemical Company were operating. The total amount of kelp used during the year was nearly 400,000 tons wet, the amount of potash (K_2O) per ton averaging about 1.5 per cent. With this were considerable quantities of iodine, nitrogen, and other by-products such as acetones and ketones.

The kelp is cut by harvesters which are very similar to grain-reapers, the notable feature being that reciprocals cut the plants 2 or 4 feet below the surface and the cut kelp is then carried up over the draper and deposited on the barge. Its treatment then varies according to whether it is to go through the "wet" or the "dry" process. Sometimes it is ground fine; sometimes it is cut into short lengths; and sometimes it is left in long strands. At the factory the kelp may be dried in large rotary driers, ground and made into fertilizer; or dried, incinerated, and then made into fertilizer; or, again, mixed with certain chemicals, permitted to ferment, and then broken up into different products by the processes of evaporation, crystallization, and fractionalization.

The last legislature placed the control of the kelp beds in the hands of the State Fish and Game Commission, and the scientific study of the plant in the hands of the Scripps Institution for Biological Research of

the University of California. At the same time, a tax of 1½ cents per wet ton was levied, and a license, costing a fee of $10.00, was demanded of every company harvesting kelp. As soon as the Fish and Game Commission assumed control, the beds were numbered consecutively from San Diego along the coast to Point Concepcion and thence about the islands, and, in order that after being harvested a bed should have sufficient time to recuperate, usually about ninety days being required, a system of opening and closing of beds was worked out. This measure not only protects the bed from depletion, but assures the

Fig. 16. Fraser kelp harvester at work off coast of southern California. Photographed by Edward E. Porteous

maximum crop. The beds off Santa Barbara were closed for the use of the United States Kelp Experimental Plant. In opening the other beds, it was arranged so that the harvesting would not interfere with the beaches during the summer season, nor with unprotected beaches during the winter, it being the intention of those concerned to regulate the harvesting of kelp with as little inconvenience as possible to neighboring communities.

What effect the harvesting of kelp has on the fishing industry has been carefully studied by the U. S. Bureau of Fisheries, by the Scripps Institution and by many fishermen, and no injurious effect has been apparent as no fish eggs are found attached to the upper portion of the kelp plant and only this upper portion is cut. However, kelp-harvesters and fishing gear in the same bed are not good companions, to say the least, and better co-ordination between the two industries represented is being planned.

THE GROWTH OF KELP.

By EDWARD PORTEOUS.

Studies of the life history and growth of kelp *Macrocystis pyrifera* are most fascinating, but this phase of the kelp problem has received very little attention from the industries dependent upon it. These, seemingly content with the fact that it does replace itself in time, have left the working out of its phases, environment, reproduction and growth to those scientifically inclined, who, in turn, look at it from an entirely different aspect from the manufacturer who is so dependent upon the plant as his source of revenue.

The harvesting of kelp over comparatively large areas has given some small insight into the life of the plant. This knowledge undoubtedly could be greatly increased if the state could appoint someone to take up this and many of the other problems connected with the comparatively new industry.

After the harvester has cut a bed clean, to the depth of four feet, the old kelp may be seen standing in an upright position with its growing ends cut off, looking not unlike a poplar tree. The kelp thus cut gradually lightens in color and appears to disintegrate and gradually disappear. This disintegration seems to start from the cut end and extend downward toward the holdfast, but usually before it has entirely disappeared from view it is hidden by the fresh shoots coming up from the rizomes.

Fig. 57. Growing ends of kelp (*Macrocystis pyrifera*). Photograph by Edward E. Porteous.

Variation in the character of a bed is often noticed. Bed No. 24 in 1916 showed unmistakable "lanes" of water or clear places, looking not unlike "roads" left by the harvesters; but examination showed no plants beneath the surface. These long lanes of clear water, which

were devoid of kelp, were about ten to twelve feet in width and were parallel to each other, and as a whole parallel to the trend of the coast. Two explanations of the phenomenon can be given: First, this condition might have been caused by the covering up of portions of the rocks to which the plant attaches its holdfast by the "sand waves" caused by the meeting of two currents, one from Santa Monica Bay, flowing southward, and the eddy current, near the shore, flowing northward. Second, geologically the land adjacent to this bed belongs to the Quaternary system, which all shows more or less deformation. The power of the sea which is derived chiefly from the winds, makes an effective eroding agent, and, since the land resists erosion, according to the coherence of the rock masses, the harder offering more resistance and the softer being moved by the onrush of the waves along the beach in the direction of the heaviest storms or prevailing winds, that which is fine enough is taken up by the water and deposited in quieter regions beyond the action of the waves. Owing to the deformation of the stratification of the land, and the upturned hard strata, following the configuration of the deposition, would present long, comparatively flat, parallel ridges upon which the plant might attach itself, while the "valleys" or softer portions between the harder strata, would be of such a nature that the plants, if attached, would break away, and thus leave voids in the continuation of the beds.

Another idiosyncracy of the same bed, which can be explained more easily by the first speculation given above, is seen in the fact that the following year these "waterlanes" had entirely disappeared and in their stead there had appeared a large oval-shaped clear patch, apparently devoid of kelp. This was a little farther northward and closer in shore, but it possessed the same general trend on its longer diameter as the "waterlanes." Undoubtedly the changes of the current had deposited a sort of "bar" of sand, which covered up the holdfasts, and the harvesters having cut their growing ends thus destroyed the plants in this area.

A noticeable fact in the growth of kelp is that the leaves are much longer and broader and the stipe or stem heavier and thicker in the kelp on the surface than is the case with the kelp that is always beneath the surface. Once on the surface the growth is greater, owing to the plant now being able by photosynthesis to build up plant material. The cells admitting the penetration of the various salts held in solution, more especially the potash, stimulate nuclear division, and cause the leaf to expand and likewise increase in weight. No doubt growth is aided by osmotic pressure also, as well as by the influence of the sun's rays.

Since all matter absorbed by the plants must pass through the cell wall, and since no solid material can be taken up as nutriment, the food, on entering the cell walls, must be either in a liquid or gaseous state. The cells not only allow the entrance of a fluid, but also some of the substances held in the solution. This free path of a solution, having crystalloids in suspension, is of vital importance in the upbuilding of the plant, and incidentally in the maintenance of a potash plant or factory, for without this tiny cell's power to absorb the potash from the ocean, America would be dependent upon the Strassfurt and various smaller deposits of crude salts, as before.

It follows that if a solution can enter into the cell, it would have first to pass through the protoplasm by way of the cell's wall; but living protoplasm, unlike its walls, gives permeability to all substances in solution in varying amounts, segregating certain crystalloidal bodies from others, according to conditions. This power of decision is not entirely limited to the outer protoplastic covering or membrane. The vacuole's wall has a similar distinction in its selective ability, and this selective power is so much greater than the osmotic pressures bearing on the cells that they often show great variation in chemical constituents and quantities to their surrounding medium. It seems remarkable that this medium containing three per cent of chloride of sodium, four one-hundredths of one per cent potash, and with the proportion of iodine so small that it requires more than 30,000,000 pounds of the sea water to furnish the kelp with one single pound of iodine, that we find that the cells of some of the plants select one and eight one-hundredths per cent potash, six-tenths of one per cent sodium, and three one-hundredths of one per cent iodine, in their fresh and natural state. These small

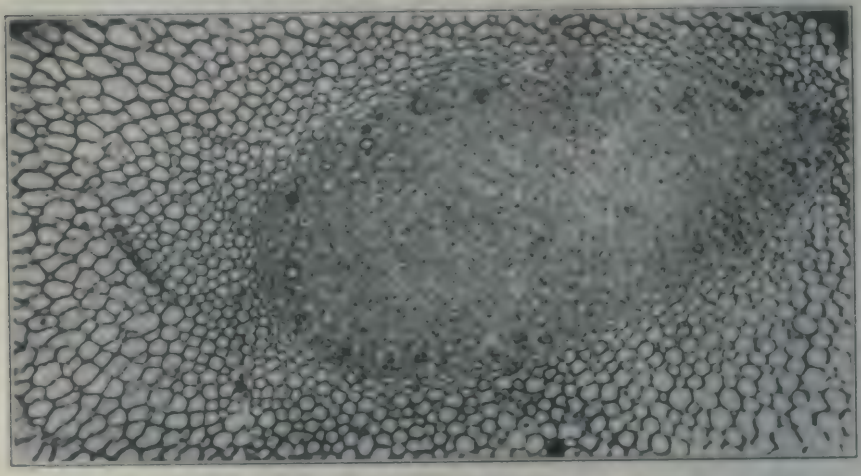

Fig. 58. Cross section of stem of kelp greatly enlarged. × 400. Photograph by Edward E. Porteous.

elementary substances are large when compared to the quantity of metals the sea holds in solution, and upon which the seaweed has some absorptive power. In the case of gold there is about one grain in every ton of sea water, yet kelp has been known to absorb twenty cents worth of this precious metal to the ton of green kelp. In the case of silver, there is about one grain to every six tons of sea water; but so far, except in the case of *Pocillopora alcicornis*, analyses have not shown silver in the plants. Of the lesser metals, no doubt traces may be found. However, very little work has been expended in this direction.

The rate of growth and the growing period, or seasonal growth, are still mooted questions. While it is believed that kelp grows all the time, it appears that there are periods when the growth is more luxuriant. At least, this is borne out in the following observations. On bed No. 21, which undoubtedly has been cut over more than any single bed on the coast, and one which the writer has had under observation

for three years, we find there are two main growing periods about six months apart; the larger and better growth of the two being from July to September, the other one January to April, the winter period requiring a little longer, owing to cloudy weather. Dark days retard growth, while bright sunny days accelerate it, no doubt aided by the water being more or less obscured by the sand and silt from the rainy season and storms that agitate the shore line.

After the growing end is destroyed, or cut off, it takes about 170 to 180 days for the kelp to grow from the holdfast to the surface (the mean depth of bed No. 21 being seven fathoms). There is a constant growth of fresh shoots, about four to six feet under the cuttings, which can best be seen after a bed is cut over. If the cutters had cut lower than four feet under the surface of the water these shoots would have been destroyed and thus the appearance of the kelp on the surface would have been delayed. This same appearance of young kelp on a cut over bed can also be noticed on portions of bed No. 24, which owing to its greater variation in depth, is not as uniform in its fresh growth as the former bed.

A ten-foot length, floating on the surface at a falling tide was measured back under water to a depth of ten feet and cut in the endeavor to find the maximum number of leaves and their lengths on this twenty foot cutting. The results were as follows:

1st foot from growing end, 9 leaves, weighed 1 oz., longest leaf 12 inches and the diameter of the stipe just back of the splitting area was 3-32 inches
4th foot from growing end 5 leaves, weighed 2 oz., longest leaf 17 inches
5th foot from growing end 5 leaves, weighed 3 oz., longest leaf 19 inches
6th foot from growing end 5 leaves, weighed 3 oz., longest leaf 19 inches
7th foot from growing end 5 leaves, weighed 3+ oz., longest leaf 19 inches
8th foot from growing end 5 leaves, weighed 3¼ oz., longest leaf 19¼ inches
9th foot from growing end 5 leaves, weighed 3½ oz., longest leaf 19½ inches
10th foot from growing end 5 leaves, weighed 3½ oz., longest leaf 19½ inches
11th foot from growing end 4 leaves, weighed 3 oz., longest leaf 19½ inches
12th foot from growing end 5 leaves, weighed 3½ oz., longest leaf 20 inches
13th foot from growing end 4 leaves, weighed 2¼ oz., longest leaf 18 inches
14th foot from growing end 4 leaves, weighed 2¾ oz., longest leaf 18 inches
15th foot from growing end 4 leaves, weighed 2¾ oz., longest leaf 18¼ inches
16th foot from growing end 3 leaves, weighed 2 oz., longest leaf 18¼ inches
17th foot from growing end 4 leaves, weighed 2¼ oz., longest leaf 18¼ inches
18th foot from growing end 3 leaves, weighed 2 oz., longest leaf 18¼ inches
19th foot from growing end 3 leaves, weighed 2 oz., longest leaf 19 inches
20th foot from growing end 3 leaves, weighed 2 oz., longest leaf 20 inches

The diameter of the last foot of stipe was 9-32 of an inch. Plotting the above figures, we find that there is a wide discrepancy between the weight and the number of leaves up to the third foot. From here on, while the number of leaves per foot remains constant up to the tenth foot, the weight gradually increases up to the same division. From here on, the variation is very small; at the seventeenth foot the weight falls a little lower than the general average, the tenth foot marking the nodal point, from which on one hand, the growing end, the number of leaves and the weight per foot gradually approach from nothing, to about the fourth foot, where the number of leaves per foot remain constant up to the ten foot or nodal point. From this point toward the holdfast, weights and numbers of leaves have about the same constant, rising and falling in unison.

The maximum number of leaves is at or near the third foot; while the greatest weight per foot is at the tenth. The size of the stipe follows

a close ratio to the width of the leaves; while, strange to say, the ratio between the length of the leaves and the weight, after the tenth or twelfth foot falls away. This, of course, can easily be explained by the fact that the number of leaves also decreases.

The weights and sizes of leaves of a section of kelp measuring forty-five feet were as follows:

1st 5-foot length	15 oz.	largest leaf 20x4	inches, stipe diameter	8/32,	40 leaves
4th 5-foot length	32 oz.	largest leaf 43x1½	inches, stipe diameter	12/32,	28 leaves
5th 5-foot length	20 oz.	largest leaf 55x1½	inches, stipe diameter	10/32,	19 leaves
6th 5-foot length	13 oz.	largest leaf 58x1	inches, stipe diameter	9/32,	15 leaves
7th 5-foot length	8 oz.	largest leaf 25x1	inches, stipe diameter	8/32,	10 leaves
8th 5-foot length	5 oz.	largest leaf 18x1	inches, stipe diameter	8/32,	8 leaves
9th 5-foot length	3 oz.	largest leaf 18x½	inches, stipe diameter	8/32,	5 leaves

The third to fifth foot shows the most rapid changes in growth. Up to this point the plant as a whole develops in the same ratio. The most even tenor of the plant's life as far as growth is concerned is found between the fifth foot and that portion which just enters the water toward the holdfast; in other words it is in that floating portion on the surface of the water, and that portion of the plant just below the tidal influence, that the most rapid changes take place in the number of leaves and the weight per foot. The length of the leaf remains fairly constant until such a part is reached that, owing to the more or less transparent condition of the water, the natural growth of the leaf is affected.

The above measurements and weights are given simply as examples of growing kelp, and really are not sufficient in number nor collected from enough different areas or seasons of the year to arrive at a general conclusion.

ENEMIES OF KELP.

Now that we are utilizing kelp both as a source of revenue and as a raw material for manufacturing a commodity, we are jealous of the various forms of life that live upon the seaweed. Some are quite harmless in their habits; others more destructive, from our point of view.

A large trochid which feeds upon the kelp, although consuming such a small amount as to be negligible, yet clings to the plants in such great numbers at certain seasons of the year that it greatly affects the calcium content of the output. Some beds of kelp are more affected than others. Another calcareous tube worker, the *Spirorbis borealis*, easily mistaken for a small shell, is found sometimes so thick as to give the kelp leaves a bleached appearance, literally covering both sides of the fronds and extending over quite large areas, increasing the weight forty per cent. The *Trochiscus norrisi* mentioned above is very much heavier in proportion to the *Spirorbis*, but their number luckily is not as great, a square centimeter of the frond holding sixty to seventy *Spirorbis*. *Flustra membranacea*, a polyzoan, forming a gauze-like incrustation on the leaves and stipe and occupying irregular patches, sometimes nearly covering the whole frond, also increases the calcium percentage. These and many others, although in a lesser capacity, more or less affect the general chemical constituents of the plant.

So far only one gastropod, an acmaea, has been found to be really destructive to kelp. It really prefers an *Egregia* plant to a *Macrocystis*, but it is not above devouring the stipe to such dangerous proportions that it breaks off and is cast adrift at the first heavy swell or storm that passes.

THE MUSSELS OF THE PACIFIC COAST.*

By EDWARD P. RANKIN.

To most of those who have spent any time on the seashore, the mussels, clustered in balloon-shaped masses on the pilings of wharves or scattered in irregular groups on the rocks, are a familiar sight. It is the purpose of this paper to make these mussels more widely known, to introduce them to those people who have had no opportunity to make their acquaintance at first hand, and to make them, if possible, more interesting to those who have met them already.

We have, on the Pacific coast, two species of mussel: a small one, *Mytilus edulis*, and a large one, *M. californianus*. The latter-named

Fig. 11. [illegible] mussels found in California. Left, *Mytilus californianus*, a large form found along the entire coast; right, *Mytilus edulis*, a smaller species confined more largely to inlets and bays. Photograph by W. C. Morrow.

species, which can attain a length of ten inches, is known from Socorro Island (in the Revilla Gigedo group, about 250 miles south of Lower California) to Alaska; its shell has both radial and concentric markings, and varies in color from light brown to dark purple. This mussel likes the salt water of the open coast, where it clings to reefs and wharves. *M. edulis* rarely exceeds three inches in length and has a shell that is smoother (lacking the radial lines) and darker than that of *californianus*. It ranges from San Diego northward and prefers the more sheltered and brackish waters of inlets and bays such as San Diego Bay and San Francisco Bay.

*Printed by permission of the United States Bureau of Fisheries.

In structure the two species are very similar. Externally, there is the bivalve-shell, narrowed to the *umbo* or "beak" at the anterior end, and hinged at the "back" or dorsum by an elastic piece of cartilage-like substance that tends to pull the shell open (see fig. 60). Internally, the shell is lined with a membrane, called the *mantle*, for the protection of the animal within; the mantle bears the shell-forming glands that serve both to add to the size of the shell and to repair breaks (see fig. 61). During most of the year the mantle is a very thin-looking tissue indeed, but in the spawning-season it becomes greatly thickened and swollen by the eggs or the milt. On each side, between the mantle and the "body" of the animal are the gills, two layers of extremely delicate tissue; they can be distinguished from the mantle by reason of the very fine longitudinal lines which mark them.

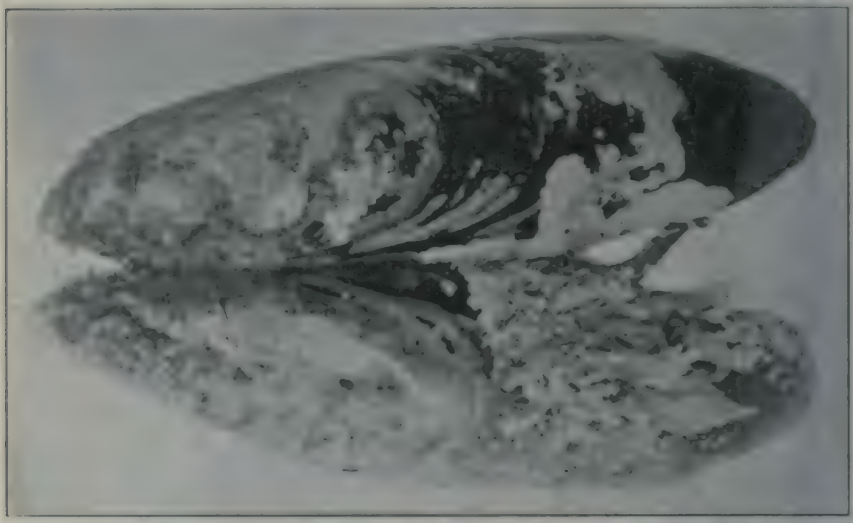

Fig. 60. Exterior of California mussel. Photograph by W. C. Mathews.

The "body" contains the digestive tract and bears the foot. In an opened mussel, one can see, at the anterior end, four leaf-like pieces of tissue growing out from around a slit-like opening; this opening is the mouth or labium, and the pieces of tissue surrounding it are the labial palps, which by their motion help to direct the food into the mouth. The remainder of the digestive tract is rather difficult to trace; its course will be merely outlined. From the mouth the food passes into the gullet, forward of the foot, and then into the stomach, which lies in a mass of dark-colored tissue, the so-called liver; the intestine passes back to the big posterior adductor muscle, around which it bends, then passes forward to the heart and back again to the muscle already referred to. Like other molluscs, the mussel has a closed circulatory system, with heart and blood vessels; it has also a very simple and primitive nervous system. The tongue-like foot is the organ of locomotion during the juvenile period; it contains the byssus gland, which will be referred to more fully farther on.

Finally, there are three sets of muscles which can be found more or less readily. First, there are the adductor muscles with which the animal closes his shell; one of these, the posterior adductor, is the large muscle which must be cut before the shell can be opened; the other, the anterior adductor, is a small muscle at the anterior end. Then there are the muscles which protrude and retract the foot; these are fastened "fore and aft," some of them lying parallel to the hinge; the outlines of the posterior retractors are shown in the photograph (fig. 61). Lastly, the fine pallial muscles serve to attach the mantle edge to the shell.

When the soft parts have been removed, one can see, on the inside of the shell, the "scar" where the posterior adductor muscle was attached, and the pallial line which marks the region of the edge of the mantle.

Fig. 61. Interior of California mussel showing body structure. Photograph by W. C. Mathews.

It is not yet known when the Pacific coast mussels spawn. Dealers believe that spawning takes place as early as April or May, but at San Diego, in 1917, the mussels certainly were not in spawning condition before the latter part of July. However that may be, the resulting young mollusks are able to swim about within a very few hours. They continue to be free swimming (or, to express it more explicitly, they are carried about by the tidal currents) for about four or five days. At any rate, this is what Dr Field (1909) reports for the Atlantic coast mussels, and it is likely that ours behave in much the same fashion.* The young then grow a shell, begin crawling over solid objects by means of the foot, and at last attach themselves to something solid. The attaching threads, constituting the *byssus*, or "beard," are produced by the byssus gland previously mentioned. These threads are

*Field, Irving A. 1909. Food value of sea mussels. Bull. U. S. Bureau of Fisheries, vol. 29, pp. 85-128.

probably of a glue-like consistency at first, but harden into the firm, stiff fibers which hold the mussel so securely to his perch.

From now on, the mussels are practically settled for life; doubtless they can shift about in a very limited area on the object to which they are fastened, but their days of "roving" are ended.

Owing to the precariousness of their existence, of the countless numbers of young that are produced each season comparatively few live to maturity and to "ripe old age." At the beginning, many probably fall prey to small fishes and to other carnivorous creatures; many doubtless succumb to the lack of food, while still others may fail to find suitable places for attachment. Those that succeed in becoming fixed are still exposed to attacks from carnivorous inhabitants of the sea. Their worst enemy on the Pacific coast is the starfish, which has been known to destroy immense mussel beds in a short time.

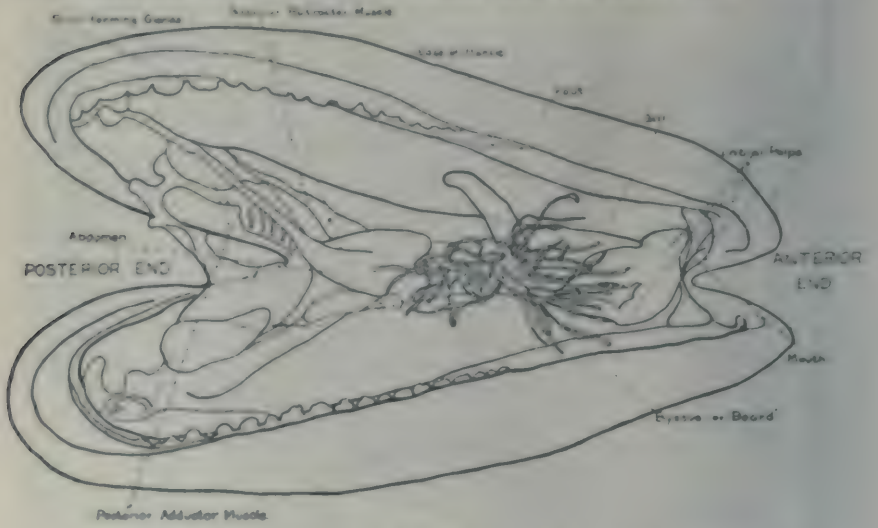

Fig. 64. Diagram showing the internal structure of a California mussel.

Members of the species *californianus* mature in about two seasons, and in that time attain a length of from two to four inches. At the Scripps Biological Station, near La Jolla, a concrete pier was put down in November, 1915; in July, 1917, two seasons later, most of the piles were thickly clustered with mussels, some of which were four inches long. It is not known what the life of the mussel is, but it probably is six or seven years at least, and possibly longer.

As is the case with other mollusks closely related to it, for instance, the clam and the oyster, the mussel swallows everything that comes his way. He simply opens his mouth, lets the sea water enter, and then proceeds to digest and to assimilate whatever there may be of value as food. The water teems with organisms that are microscopic in size; among them are the diatoms, which are one-celled plants, and many species of protozoans or one-celled animals. These constitute the bulk of the food of mollusks like the mussel. It has been demonstrated that diatoms constitute 98 per cent of the bulk of the food of the oyster, and the mussel likely uses about the same quantity of diatoms in its diet. To be sure,

undesirable substances, as well as desirable ones, find their way into the mussel's digestive tract, for the mussel has no power of selection and everything that is small enough is taken in with each swallow of water. For this reason, there is danger in eating mussels which have lived in polluted or stagnant waters, because disease germs and poisonous substances may be harbored in the animal's body. But there is no danger from this source when the mussels are taken from the clean sea water of the open shore.

Sporadic cases of poisoning have occurred on the Pacific coast and elsewhere. Though many have been attributed to ptomaine, their cause is not definitely known. The evidence goes to show that, in most of these cases, the mussels had been gathered from high up on the rocks, either during or immediately following a period of hot weather. Because of this, during the summer months one should not eat mussels unless they have been taken *from under the water*.

For a long while fresh mussels have been on the market in a few of the restaurants, though in limited quantities. It is only within the last few years that any attempt has been made to can them on the Pacific coast. Their preparation for the market involves no little labor and considerable handling. It was our privilege, a short time ago, to watch the process of getting mussels ready for the San Francisco market. These mussels were of the small species, *M. edulis*, taken in the bay.

Put into deep, wire-bottomed trays, they were washed thoroughly to remove the mud and silt adhering to the shells. Then they were transferred to narrow wooden vats, where they were "worked," much as mortar is worked, by two men with hoe-like rakes; this process serves to separate the mussels one from another and to remove many of the barnacles from the shells. From here the mussels were hauled to a shed in which was a long table, on which they were dumped; then, taking one mussel at a time, the men went through the whole pile, throwing out broken shells and dead mussels, and with flat iron bars knocking off the remaining barnacles. The fresh mussels, washed and cleaned, were then ready for market.

For canning purposes, the preliminary process is practically the same as that just outlined. Having been cleaned, the mussels are placed in trays in an oven or a retort, and heated till they open. The meats and the liquor are placed in cans which, after being sealed, are put into the retort again and subjected to steam heat for a certain sufficient length of time to cook the mussels and to sterilize the contents of the cans. They are then ready for the market.

Both fresh and canned mussels can be prepared for table use as readily and as quickly as can oysters. They are wholesome, nutritious and deliciously flavored; moreover, they are as cheap a food as can be had in these days of increasing expenses. Several packers in California are making preparations to begin the packing of this food, hitherto unutilized, and it is hoped that before another year has gone by the mussel will be a staple and "standard" article of diet.

THE MACKEREL AND MACKEREL-LIKE FISHES OF CALIFORNIA.*

By EDWIN CHAPIN STARKS, Stanford University.

The group composing the mackerel and mackerel-like fishes is commercially one of the world's most important groups of fishes containing as it does the true mackerel of the Atlantic coast and the albacore of the California coast. Only the herring group surpasses it in value. It contains some of the swiftest fishes that swim as well as some of the largest. Most members of the group are built for speed, the fins folding into grooves in the body, the mouth and gill covers fitting tightly and smoothly, and with no projections on the head or body to break the continuous curves. The contours are said by nautical engineers to be perfect for passage through the water with the least resistance. But among these fishes are many variations of form of body, some of which are not at all adapted to swift swimming.

Usually the head is sharp, the tail slender and with a widely forked caudal fin, the scales very small and thin, and the color silvery and metallic. Usually the dorsal and anal are elevated to a point in front with the outline just behind the point concave. Many of them have the pectoral fins scythe-shaped, and most of them have a keel on each side of the tail.

These fishes are closely related to the bass-like fishes. Though differing from them very much in the extremes they grade into them, on the other hand, so that they can be separated only arbitrarily.

Among the mackerel-like fishes are several pelagic fishes or fishes of the high seas, that are occasionally taken on our shores, but so rarely that there is little reason for including them in a report of this character.

GLOSSARY.

Air bladder: A thin walled sac lying in the upper part of the abdominal cavity.

Anal fin: The fin on the lower side of the body. Sometimes in two parts but never paired (two side by side).

Caudal fin: The tail fin.

Compressed: Said of the body when it is flattened from side to side.

Dorsal fin: The fin on the back, often divided into two fins, the first usually of stiff spines and hence called spinous dorsal.

Finlets: The little detached fins behind the dorsal and anal in the mackerels.

Keel: The sharp projecting ridge at the side of the tail.

Maxillary: The flattened bone bordering the mouth above.

Pectoral fin: The uppermost of the paired fins. Situated close to the gill opening.

Ventral fins: The paired fins on the lower part of the breast, close under the pectorals in these fishes.

*A report of the Committee on Zoological Investigations of the State Council of Defense.

Families of the Mackerel and Mackerel-Like Fishes.

Small finlets follow the dorsal and anal fins. A projecting keel on each side of tail (except in *Scomber*). Ventral fins present. *The Mackerels* (*Family Scombridæ*) page 119.

No finlets follow the dorsal and anal fins. A projecting keel or ridge on each side of tail. Ventral fins present. *The Yellow-Tail and Horse-Mackerel* (*Family Carangidæ*) page 124.

Upper jaw prolonged into a sword. A pair of long single rayed ventral fins present. *The Marlin-Spike Fishes* (*Family Istiophorida*) page 126.

Upper jaw prolonged into a sword. No ventral fins present. *The Swordfishes* (*Family Xiphiidæ*) page 127.

A single long dorsal and anal fin without sharp spines. Body deep and compressed. No ventral fins. *The California Pampano* (*Family Stromateidæ*) page 128.

THE MACKERELS.

(*Family Scombridæ.*)

In this family are the mackerel, bonito, skipjack, albacore, and Spanish mackerel. All but the mackerel (*Scomber*) have a keel-like projection on the side of the tail with sometimes a pair of small ones. *Scomber* lacks the keel in the middle of the side but has a pair of small ones on each side. Most of the mackerels have very small scales. In some of them these are enlarged and crowded together at the front of the body in a corslet. In all of them the dorsal and anal fins are followed by detached finlets. The caudal is widely forked and the tail exceedingly slender. The color is usually metallic steel-blue and bright silvery.

The Mackerel (Scomber japonicus).

The mackerel has a high, triangular first dorsal fin with 9 or 10 spines. It is separated by a considerable space from the second dorsal, which is much lower. The anal is similar to the second dorsal and is a trifle behind it. Both dorsal and anal fins are followed by 5 or 6 finlets.

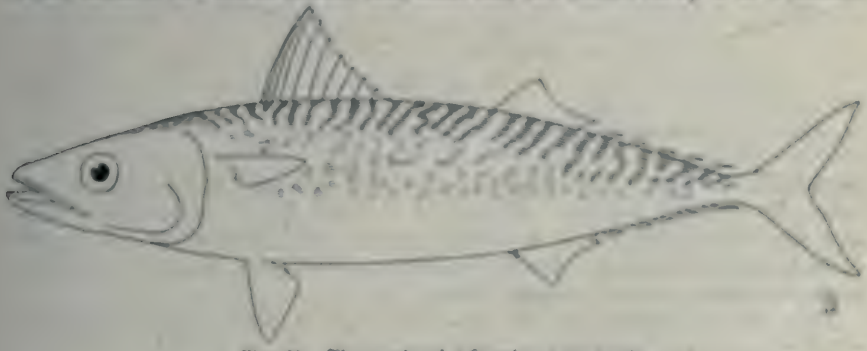

Fig. 63. The mackerel (*Scomber japonicus*).

The pectoral fin is rather short, or about as long as the distance from the eye to the gill opening. On each side of the tail are a pair of keel-like projections. The color most readily distinguishes the mackerel from its relatives. It is blue above and silvery below, with many crooked, blackish bars extending downward from the back to the middle

of the side. The lower part of the side is usually more or less mottled with dusky blotches.

In California, though we call this fish the mackerel, without differentiating it from the true mackerel of the Atlantic, we must remember that it is a very different fish. It differs particularly in having an air bladder which is entirely lacking in the true mackerel. Its dark bars are not so clearly cut, and it has a larger eye. The true mackerel has no dusky mottled spots on the lower part of the side, and there are several other differences.

This mackerel is widely distributed over the Atlantic and Pacific oceans, being found north to England, Maine and San Francisco. It is common in the Mediterranean and in southern California. It may be that more than one species is found in this wide range, but no one has as yet found any characters that are constant enough to separate it. It is known as the chub, or thimble eyed, or tinker mackerel on the East coast. It is somewhat inferior to the true mackerel, but nevertheless it is a good and important food fish, particularly good broiled or baked, and attention is now being directed towards canning it, or salting it in wooden kits as the Eastern mackerel is. Recent Atlantic coast quotations (early May) list this fish under the name of tinker mackerel at from 28 cents to 35 cents a pound in the wholesale market. It retails in California at 10 cents a pound.

(The Spanish Mackerel (Scomberomorus sierra).

The Spanish mackerel may be known by the long slender body, the teeth flattened and dagger-shaped, the spinous dorsal long and with little space between it and the second dorsal, and particularly by the spots on the side of the body. The maxillary reaches to below the hind

Fig. 64. The Spanish mackerel (*Scomberomorus sierra*).

border of the eye. The length of the head is equal to, or exceeds but little, the greatest depth of the body. It has 9 finlets behind the dorsal and the anal. The color is silvery on the side and lower parts and dark blue on the back. On the side are five or six rows of elliptical spots of bluish or dull orange color.

This fish is common on the Pacific coast of Mexico and has been reported in some abundance off San Diego. It is hoped that when it is next seen within our waters its occurrence may be reported to the Fish and Game Commission in San Francisco and if possible a specimen saved.

On the Atlantic coast is a Spanish mackerel that is very close to ours, if not identical with it, that is valued among the very best of food fishes. The name Spanish mackerel has been applied to various mackerel-like fishes, but this and the next are the only ones on our coast that should be so called. In England our common mackerel is called Spanish mackerel, and in California the oceanic bonito is also sometimes given that name.

The Monterey Spanish Mackerel (Scomberomorus concolor).

This fish resembles the last (*S. sierra*) in general characters, but it may be most easily distinguished from it by the sides having only two series of spots (female) or none at all (male).

It appeared in Monterey Bay nearly 40 years ago and for a few years was taken in some abundance, appearing each year in September and staying only a couple of months. It commanded a high price in the market. Since that time it has never been reported, nor is it known from any other locality. If ever taken specimens should be preserved in formalin (1 part formalin, 15 parts water) and sent to the Fish and Game Commission.

The Skipjack (Sarda chilensis).

This species is rather slender, though less so than the Spanish mackerel. It may be known by the narrow dark stripes on the back that do not follow the outline of the back but run obliquely back and slightly up from the side. The lower ones run from the region of the

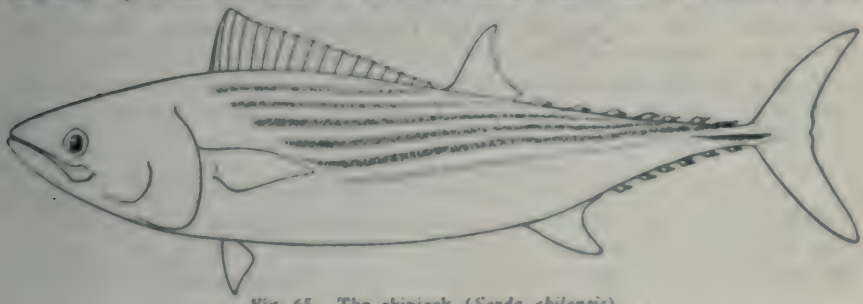

Fig. 65. The skipjack (*Sarda chilensis*).

pectoral to the upper part of the tail and the last dorsal finlets. The front of the anal is behind the second dorsal. The pectoral is short and its length is about equal to the distance from the eye to the gill opening. The length of the head is greater than the depth of the body. It has seven or eight finlets behind the dorsal, and six or seven behind the anal.

The skipjack is found in abundance in summer on the California coast and is known as far northward as Puget Sound. It is common along the South American coast and in Japan. It reaches a length of three feet and its flesh is dark red, oily, and rather coarse.

The Tuna, or Tunny (Thunnus thynnus).

The tuna, or leaping tuna of the anglers, may usually be known by its great size, but size can not be altogether relied upon to distinguish it. It is a deep, thick, heavy-bodied fish, with a pectoral fin shorter

than the length of the head and without conspicuous stripes on the body. The color is deep blue on the back but with greenish reflections,

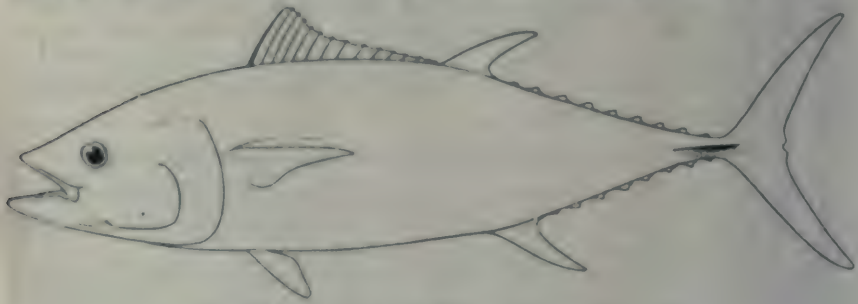

Fig. 66. The tuna (*Thunnus thynnus*).

and the lower parts are silvery. When freshly caught it is very brilliant with a play of metallic colors. It is sometimes canned with the albacore under the same label, and is said to be equally good. Or perhaps it is better to say that it is canned under its own label, for the albacore is, unfortunately, canned under the label of tuna.

This fish is found in all warm seas, occurring as far north on our coast as San Francisco. It is known as the tunny on the Atlantic coast. The name we apply to it, tuna, is the name that is current in the Mediterranean. In the Atlantic it is reported to reach a weight of 1,500 pounds, and individuals weighing a thousand pounds are not very rare. None is recorded on the California coast nearly that large. The largest taken with hook and line weighed only 251 pounds. The tuna is probably the hardest fighting marine fish that is classed as a game fish. Devoted to its capture under certain regulations as to light tackle is the Tuna Club of Santa Catalina Island.

The Yellow-Finned Albacore (Thunnus macropterus).

This species, like the albacore and tuna, is a heavy-bodied fish. It may be known by its pectoral, which is shorter than in the albacore and longer than in the tuna. The pectoral reaches nearly or quite to

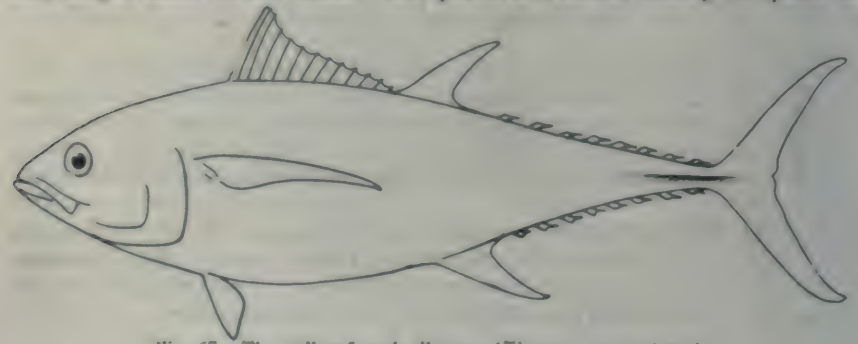

Fig. 67. The yellow-finned albacore (*Thunnus macropterus*).

the front of the anal fin, but not past it as in the albacore. The fin is longer than the length of the head. There are no conspicuous stripes on the body. The soft dorsal and anal fins are higher than those of the albacore, and the finlets are lemon-yellow.

This fish is common in Japan, somewhat less so than in the Hawaiian Islands, and at times is reported to be not rare about the Santa Barbara Islands. It is not common enough to be of commercial importance, though a game fish of note.

The Albacore (Thunnus alalunga).

The albacore may be known at once from all of the other mackerels by the great length of the pectoral fins, which reach considerably past the front of the anal, and are about two-fifths of the entire length of the fish. It is dark steel blue on the back shading to silvery below.

It is found in all warm seas and at certain seasons is common on the California coast, in Japan, and in the Mediterranean. On our Atlantic coast it is rare. On the California coast it occurs as far northward as San Francisco, though it has not been taken in abundance north of the Santa Barbara Channel. It is a fish of the high seas, and is not found

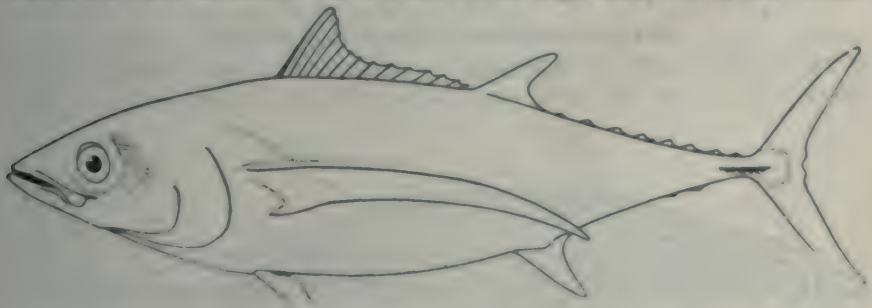

Fig. 68. The albacore (*Thunnus alalunga*).

in sheltered bays and rarely near shore. Its food is anchovies, sardines, squid, and small free-swimming fishes generally. It is most abundant from May to December, though it is taken in small numbers in other months. Nothing is known of its spawning habits or spawning grounds as yet on our Western coast. Individuals have been taken up to 70 or 80 pounds in weight, though the average is about 20 pounds. Very small ones are rarely seen on the California coast, though it has been taken as small as two or three pounds in weight. Once an entire school of small ones was reported.

As a food fish it has been little appreciated in America until within a very few years, when, canned under the name of tuna, it quickly became the most important fish in our state. This position it held until last year, when the sardine took the place of first importance. In Japan it is eaten raw.

Though the albacore is taken in abundance the demand is greater than the catch. Perhaps when some method of netting it is invented the catch may be greater. Now it is taken only by hook and line. In the commercial fisheries it is attracted to the boats by a process known as chumming.* It is trolled for by power boats, and when a "strike" is made quantities of live anchovies, sardines or other fishes are thrown overboard with the hope of attracting the school of albacore to the boat. If the school appears fishing begins with strong, short poles, short lines

*The term chumming is used on the Atlantic coast when ground bait or pieces of salt fish are used to attract a school of fish about the boat. Here it seems to be restricted to the use of live bait.

and barbless hooks baited with small fish. There is little sport in this sort of fishing and much hard work, for the albacore, if biting at all bite at once, and are lifted straight out of the water by main strength, shaken from the hook onto the deck and the hook at once baited again. Thus each fisherman may land a fish every minute or so. It is related that three men once averaged a ton each in a half hour. But the albacore is very erratic in taking the hook, or in appearing at all, or when biting well may suddenly stop, so that the catch is uncertain.

In an old book on English fisheries (W. Yarrell) I note that on the coast of France this fish is caught abundantly at a depth of 80 fathoms; that it rises to the surface to pursue flying fishes, but that fishermen take few except at great depths. This is interesting in light of the fact that ours are practically all taken at the surface. Experimental fishing may show that ours may also be taken at a depth, perhaps at times when they can not be taken otherwise.

The Oceanic Bonito (Euthynnus pelamis).

This species may be recognized by four or five dark stripes on the lower part of the side that are parallel with the lower outline of the

Fig. 69. The oceanic bonito (*Euthynnus pelamis*).

body. The back is bluish and the belly silvery, while the stripes are brownish or coppery color. The general shape of the body is similar to that of the albacore and tuna.

This fish is sometimes called skipjack by anglers, but *Sarda chilensis* has a better right to that name. Probably this confusion has arisen because both of these fishes have stripes, but the stripes on the skipjack are on the back and are not parallel with the outline of the body, while on this fish they are on the lower part of the body and are parallel with the outline.

The oceanic bonito is found in the warmer parts of the Atlantic and Pacific oceans. It is reported to be frequently taken about the Santa Barbara Islands.

THE YELLOWTAIL AND HORSE MACKEREL.

(*Family Carangidæ.*)

This is a large family especially well represented in tropical waters. Two only are found commonly within our limits. Among them are the pampanos (not the California pampano, which is a butter-fish) the cravelles, the pilot fishes, the horse mackerels, the yellowtails, and many

others. The tail is slender and the caudal fin forked. In both of our species there is a keel (though slight in the yellowtail) on the side of the tail, and no dorsal or anal finlets are present.

The Yellowtail (Seriola dorsalis).*

This fish is covered with small scales, some of them being on the cheek just behind and below the eye. The pectoral fin is rather short, about half as long as the head, and does not reach past the ventral fins. It has a slight ridge-like keel on the side of the tail, but this is much less developed than in the bonito or albacore. The first or spinous dorsal is considerably lower than the second. The front of the anal fin is a considerable distance behind the front of the dorsal and behind the middle of the body. The color is bright steel blue above and dull silvery on the side and lower parts. A yellowish irregular band extends along the side. The caudal fin is a dull yellow.

This fish is found from the southern California coast southward along the coast of Mexico. The largest one recorded weighed 60½ pounds, and

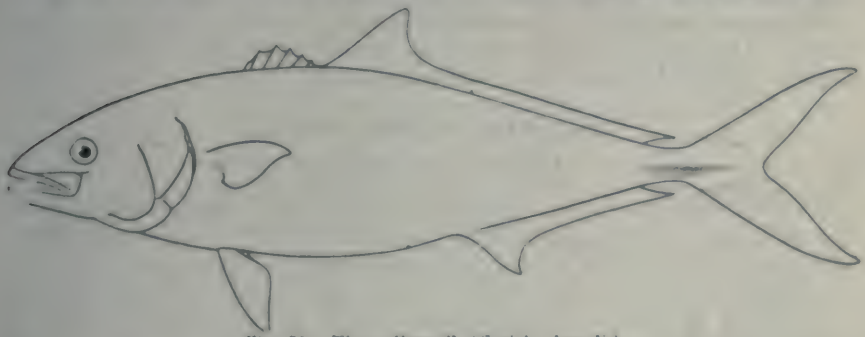

Fig. 70. The yellowtail (*Seriola dorsalis*).

this was taken with light tackle (Tuna Club record). The yellowtail is an excellent food fish and abundant enough to be of considerable importance. It is now being canned to some extent. As a game fish it has long been famous and it holds an important place in the affections of the angler.

The Horse Mackerel (Trachurus symmetricus).

The horse mackerel may be known by its having a row of vertical bony plates along the side. Above the pectoral fin this row is rather high on the side, but under the front of the second dorsal it bends down and runs straight along the middle of the side to the tail where it forms a sharp bony keel. Southward along the Mexican coast are other species with this row of bony plates, but this is the only one found within our limits.† The lower jaw projects slightly past the upper one, and the maxillary extends to under the front of the pupil. The first

*Related to the yellowtail is the pilot fish (*Naucrates ductor*). It is not given a place here because it has been taken only once or twice on our coast. It has a much lower spinous dorsal, wider keel on the tail, and smaller mouth than the yellowtail has. About five broad dark bars extend from the back to the lower part of the body.

†In 1858 another species (*Caranx caballus*) having these bony plates was taken at San Diego, but as it has not since been seen so far north it is not included here. It is common in the tropics and may be found again, so any fish besides the horse mackerel with bony plates forming a keel on the tail should be preserved.

dorsal is high and triangular, and has about eight spines. The front of the second dorsal and anal are high and pointed. The anal is preceded by two strong spines and is behind the front of the second dorsal.

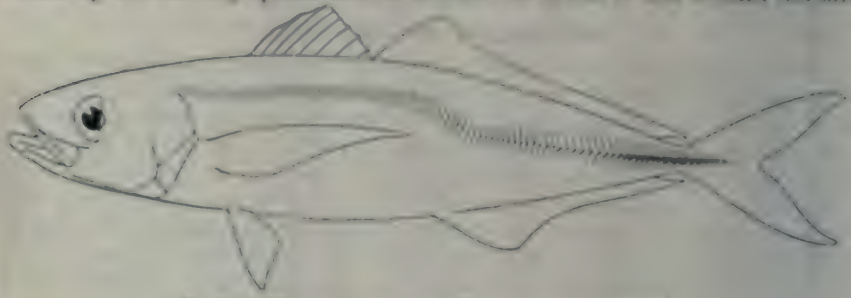

Fig. 71. The horse mackerel (*Trachurus symmetricus*)

The pectoral fin reaches to or a little past the anal spines. The back is greenish shading downward to silvery on the lower parts.

The horse mackerel is found abundantly from San Francisco southward. As a food fish it is inferior to the mackerel, being rather coarse fleshed. Little has been done in preserving it.

THE MARLIN-SPIKE FISHES.

(*Family Istiophoridæ.*)

In this family are the sailfishes (*Istiophorus*), and spearfishes of the Atlantic, and the marlin-spike fishes of the Pacific. The spearfishes and marlin-spike fishes belong to the same genus (*Tetrapterus*) though of different species. The fishes of this family differ from the true swordfishes in having small granular teeth in the mouth, in having ventral fins, and in having two keel-like projections on each side of the tail.

The Marlin-Spike Fish (Tetrapterus mitsukurii).

This species may be known by its upper jaw being prolonged into a "sword" together with its having long ventral fins composed of one ray each. The first dorsal fin is high in front where it rises to a point,

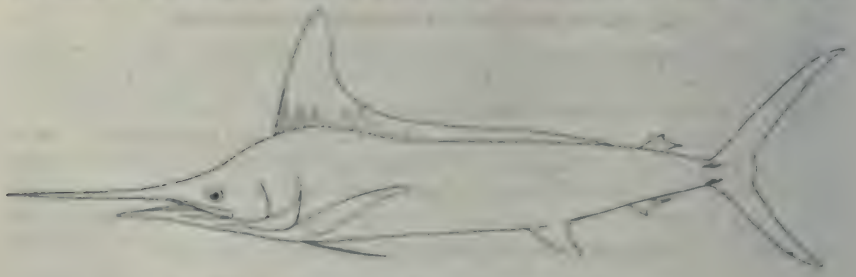

Fig. 72. The marlin-spike fish (*Tetrapterus mitsukurii*).

and is as high or a little higher than the depth of the body. The dorsal quickly becomes lower and runs for nearly the whole length of the back as a low fin, gradually growing lower and disappearing. The second dorsal is small and short; the front of it elevated to a point. The pectoral fin is about as long as the dorsal is high. The anal fin is divided

into two parts, both parts with the front elevated as in the dorsals. The first anal is about three times as high as the second, which is a little in front of the second dorsal. The sword is not sharp edged but rounded, and the point of the lower jaw reaches nearly half of the distance from the eye to the tip of the sword. The body is crossed by narrow light stripes extending down from the back.

The marlin-spike fish reaches a length of 12 feet or more. The largest one recorded by the Tuna Club taken under their specifications of light tackle weighed 340 pounds. It is now known only from Japan and the California coast, though this range will doubtless be extended when other localities are known.

Much controversy is carried on among anglers as to whether this fish may or may not be called a swordfish. It would appear that the catching of anything that bears the name of swordfish carries with it more glory than the catching of a marlin-spike fish, though I believe it is conceded that the latter is the greater fighter. If that be true why not let it stand on its own merits? The name marlin-spike sword fish being too long and somewhat ambiguous in that the sword is twice referred to, the angler has left off a very descriptive part of it and calls it the marlin swordfish, though marlin without the spike obviously means nothing at all in this connection. As this fish belongs to the same genus as the Atlantic spearfish it would be consistent to call it the Pacific spearfish. However there are, unfortunately, no rules or laws governing the use of common names so there is no reason why this fish should not be called a swordfish if it is sufficiently distinguished from the fish that has the best right to the name.

On account of anatomical differences the swordfish is placed in one family and the marlin-spike fishes, the spearfishes, and the sailfishes in another, thus indicating that the last three are more closely related to each other than they are to the swordfishes. The angler apparently objects to placing this fish in a family separate from the swordfish chiefly because it seems to rob him of his right to call it a swordfish. But considering groups higher than families they are all grouped together in a superfamily—marlin-spike, sail, and swordfishes—and spoken of as "the swordfishes." That is a zoological license for considering the marlin-spike fish a swordfish.

On the southern California coast there is a little fish that has the lower jaw prolonged into a sword. It does not exceed a length of seven or eight inches, and is often called the little swordfish. And that is an equivocal license for calling the marlin-spike fish a swordfish, for the little swordfish is not at all related to the big one.

THE SWORDFISHES.

(*Family Xiphiida.*)

In this family is the swordfish, cosmopolitan in its distribution. Only one species is now recognized. But these large fishes have not been very carefully studied owing to the lack of carefully made and accurate descriptions, and to the impossibility of preserving fishes of such size. It is not improbable that future study will reveal more than one species. Teeth are present only in the young. The ventral fins

are entirely wanting, and even the internal bones (pelvic girdle) for their support. On each side of the tail is a wide projecting keel.

The Swordfish (Xiphias gladius).

Called broadbill swordfish by anglers. The upper jaw is prolonged into a much longer sword than in the marlin-spike fish. The lower jaw does not reach over a quarter or a fifth of the distance from the eye to the tip of the sword. The sword is flattened and sharp edged. The first dorsal fin is high, curved and short, being much higher than it is long. The second is very small and is back on the tail; its height is less than the diameter of the eye. The anal is also divided into two parts. The first anal resembles the first dorsal in shape, but is much

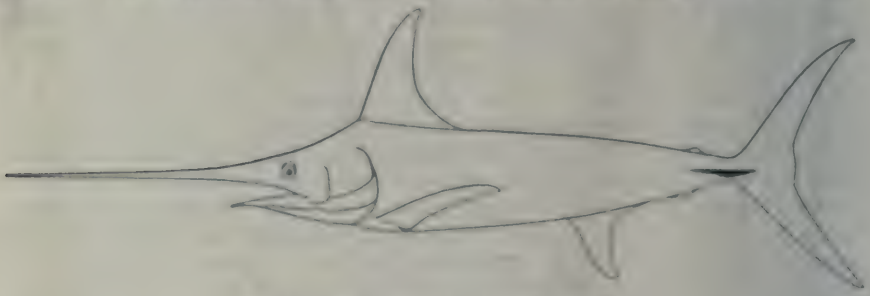

Fig. 73. The swordfish (*Xiphias gladius*).

smaller and situated behind the middle of the body. The second anal is a little in front of the second dorsal. The pectoral fins are about as long as the height of the first dorsal. The body is metallic purplish in color above and dusky below. It has no cross bars of color.

In the young the dorsal and anal are each continuous as a single long fin, but as the fish grows older the central part of the fin disappears leaving only the two ends.

The swordfish is the object of extensive fisheries on the Atlantic coast, where from 3,000 to 6,000 are taken every year. On our coast it is regarded more as a game fish than as a commercial fish, though the few that are caught find a good market. It reaches a weight of over 600 pounds. In the Tuna Club handbook for 1917 the largest recorded taken with light tackle weighed 362 pounds, but I believe that record has since been very much beaten.

The swordfish is the swashbuckler of the sea, attacking with ready sword everything that floats. It must not be confused with the sawfish, which belongs to the group of sharks and skates.

THE BUTTER FISHES.

(*Family Stromateidæ.*)

Belonging to this family are the butter fishes, or harvest fishes of our Atlantic coast, and the so-called pampano of California. They are only distantly related to the mackerel group, but more nearly related than to any other group that will be treated of in these papers, and so are here included. The family is represented in California by one species. It has no separate first, or spinous, dorsal, and no ventral fins. The body is deep and thin (compressed).

The California Pampano (Palometa simillimus).

The body is compressed and deep; about half as deep as it is long without the caudal. It is covered with fine scales. The profile of the head is rounded and with a blunt curved snout. The single dorsal and anal are similar, long, highest in front, low behind, and extending

Fig. 74. The California Pampano (Palometa simillimus).

nearly to the caudal fin. The front of the anal is behind that of the dorsal. The pectoral is long. When turned forward it reaches past the snout, and in its natural position far beyond the front of the anal, or nearly half way from its base to the caudal fin. It is bluish above and silvery below.

This is a highly prized food fish, reaching a length of 10 inches, and found from Puget Sound to San Diego. About central California it is abundant in summer. Its flesh is rich and delicate. It is not related to the famous pampano of Florida, there being nothing between them in common more than the shape of the body, but it is one of the butter fishes of the East coast.

DISCRETIONARY POWERS AND GAME CONSERVATION.

By HAROLD C. BRYANT.

California for many years has administered fish and game affairs in an unscientific way. The power to make or change fish and game laws is vested only in the state legislature. The laws are enacted for at least two years and no change can be made in them during that time, irrespective of the fact that new conditions may arise and serious injuries result. Frequently it is impossible to secure the attention of lawmakers to matters that are of the greatest importance and it is impossible to put legislation into effect that is really necessary. In general, however, it may be said that our laws are as satisfactory as they can be under the present system.

WHY DISCRETIONARY POWERS ARE NEEDED.

A few years ago during the eruption of Mount Lassen, a mud flow destroyed all of the fish in Hat Creek. This creek was one of the best

streams in California and literally teamed with trout. In order to bring this stream back, it should have been heavily stocked and all fishing prohibited for at least two years. If this had been done, fishing in Hat Creek would have been as good or even better than before. The commission was powerless to close this stream.

In Inyo County a few years ago during a severe winter a great many of the mountain quail in that county were killed. It was not possible for the commission to suspend the open season for mountain quail in the fall of the year although that should have been done. The birds have not yet approached their former numbers and will not until additional protection can be given.

In 1912 in Trinity and adjoining counties a very severe epidemic occurred among the deer. Thousands of the animals were found dead. The animals remaining were not in the best physical condition and were perhaps not fit for human consumption. Certainly they were needed for breeding stock to bring back the deer to their former numbers, but it was not possible to give them protection in time.

Every few years an epidemic has occurred among wild ducks in the lower San Joaquin Valley. Thousands of ducks have died. The disease is prevalent at the time the season opens. Hundreds of sick birds are killed by market hunters and shipped to the San Francisco and Los Angeles markets. Some way should be devised whereby the killing of these sick birds can be prevented.

The coast streams are sometimes in best shape for steelhead fishing at the first of April; other years the streams should not be fished until during the month of May. It is not possible to have a fixed law that will be satisfactory.

Almost every state is from time to time confronted with problems that develop during a period of drought. If several dry winters follow in close succession, the food supply of game birds such as quail is greatly diminished and the numbers of these birds are reduced to the minimum on account of the scarcity of food and unfavorable breeding seasons. The number of birds killed during such years by hunters should be cut down in order to conserve the breeding stock. It is impossible to do so under a system that is wholly controlled by the legislature. Forest fires often cause similar conditions which demand immediate action.

During the strenuous times through which we are now passing with the world at war, we are impressed with the necessity for making immediate changes in our laws so as to provide for the greatest production of fisheries products. The laws regulating the taking of fish can not be modified until the legislature meets. If the Fish and Game Commission had discretionary powers, the use of nets in prohibited waters and the use of other kinds of nets that should be prohibited under normal conditions could be allowed and the fish markets of the state provided with a greater abundance of fish. After the war, the laws could be restored; perhaps made a little more severe in order to bring back the fish to their original numbers.

OTHER STATE COMMISSIONS HAVE DISCRETIONARY POWERS.

It has been found necessary in order to properly safeguard the horticultural and agricultural interests of the state against injurious insects to give discretionary powers to the State Horticultural Commission. It has also been deemed necessary to give such powers to the

State Board of Health. Discretionary powers have been given to these boards by the state legislature, so that it would not be without precedent were the Fish and Game Commission given similar powers.

GAME COMMISSIONS IN OTHER STATES HAVE DISCRETIONARY POWERS.

California would not be taking an untried step if the Fish and Game Commission was allowed to use its discretion in times of necessity.

In Maine, newly stocked streams are closed to fishing at the direction of the Fish and Game Commission.

The New York Conservation Commission has power to change the deer season according to the conditions that may arise in the different localities.

In Washington, the commission has the power to close any lake or stream for fishing, should in their opinion the fish in these streams or lakes require additional protection.

In Oregon, the commission has power to close or suspend the open season for the taking of game or fish at will.

In Nevada, the Board of County Commissioners can change the open season on many different species of game.

In Michigan the state game, fish and forest fire commissioner of the Public Domain Commission, has the power to suspend, abridge or otherwise regulate the open season on any kind of game or fur-bearing animals or game birds found in a wild state in any designated area, where it becomes necessary to assist in the increase or better protection of any particular kind or species of such game.

Similar authority is delegated to game commissions in other states.

Congress has placed in the hands of the Department of Agriculture discretionary powers in order that the Federal Migratory Bird Law may be properly enforced.

According to the Minister of Game and Fisheries of Canada, no provision in the game act of that country has proven so useful as has the section under which the Lieutenant Governor in Council may make legislation preventing the hunting of game that may appear to require more protection than is given by the act.

SOME SOLUTION NECESSARY.

The conditions above outlined, which are of more or less regular occurrence, demand attention. It is evident that present laws applied to these conditions do not allow a solution of the problems presented. Some provision must be made to better care for such situations. Other states have given discretionary powers to the Fish and Game Commission or to the Governor and we could improve conditions in the same way. Without such powers the Fish and Game Commission can not do efficient work.

HISTORY OF LAW GIVING DISCRETIONARY POWERS.

As early as 1895, the importance of allowing the Fish and Game Commission the right to make certain regulations during the interim between the meetings of the legislature was recognized. But the suggestion was opposed by those who felt that autocratic powers were being given the commission. Increasing difficulty in properly conserving wild life under the present system of laws led the Fish and Game Commission

to bring the question before the 1917 legislature. Those opposing the measure claimed that it would be unconstitutional. The need for greater leeway in giving local protection to fish and game becomes more apparent from year to year and further attempts are sure to follow until an act which will improve present conditions is obtained.

A MODEL LAW.

What sort of a law would meet the needs in California? Before answering this question let us look at some of the laws found workable in other states.

Pennsylvania's law reads as follows:

"• • • That from and after the passage of this act, the Governor of Pennsylvania shall have authority, through proclamation, to close for a period not exceeding one season at one time, any county or counties or any section of any county, of this commonwealth, to either hunting or fishing or to close any stream or part of streams to fishing, because of excessive drought and consequent danger from forest fires, low water, and the presence of contagious or infectious diseases, when such action may be necessary to conserve either the health or welfare of our people or our natural resources."

This act provides a penalty of not less than twenty-five dollars or more than one hundred dollars. (Proclamation issued under Pennsylvania Act, P. L. 1915, 530, Sec. 1.)

Full power to suspend laws is given the State Game Warden of Arizona:

Sec. 14 (a). The State Game Warden shall have power to suspend the open season on any kind of game in any designated area where, in his judgment it becomes necessary for the protection of any particular kind or species of game threatened with extermination.

The New York law is more complicated:

"1. Petition for protection. Ten or more citizens of the state may file with the commission a petition in writing requesting it to give to any species of fish other than migratory food fish of the sea, including fish or game birds or quadrupeds, protection or additional protection to that afforded by the provisions of this article. Such petition shall state the grounds upon which such protection is considered necessary, and shall be signed by the petitioners who shall attach their addresses.

"2. Notice of hearings. If the commission shall after hearing petitioner entertain the petition it shall hold a public hearing in the locality or county to be affected upon the allegations of such petition at such time and place within the locality or county affected as the commission may determine within twenty days from the filing thereof. At least ten days prior to such hearing notice thereof, stating the time and place at which such hearing shall be held, shall be advertised in a newspaper to be selected by the commission and published in the counties or county to be affected by such additional or other protection or if less than a whole county, in or near the locality which shall be affected. Such notice shall contain a brief statement of the grounds upon which such application is made, and a copy thereof shall be mailed to such petitioner at the address given in such petition at least ten days before such hearing.

"3. Powers to grant protection. If upon such hearing the commission shall determine that such species of fish or game, by reason of disease, danger of extermination or from any other cause or reason, requires such additional or other protection in any locality or throughout the state, the commission shall have power by order to prohibit or regulate, during the open season thereof, the taking of such species of fish or game. Such prohibition or regulation may be made general throughout the state or confined to a particular part or district thereof and the order shall fix the day when the same shall take effect and the commission shall sign and enter the order in its minute book."

A public hearing and proper publicity is demanded in the Maine law:

"The commissioners of inland fisheries and game shall have general supervision of the enforcement of the inland fish and game laws. Whenever they shall deem it for the best interests of the state after due notice and public hearing in the locality to be affected, they may regulate the times and places in which and the circumstances under which game and inland fish may be taken for a series of years not exceeding four, but they can not authorize the taking of game or inland fish at a time in which its capture is prohibited by the laws of the state. They may, from time to time, modify or repeal such needful rules and regulations, not contrary

to the laws of the state, as they may deem necessary and proper for the protection and preservation of the game and inland fish of the state. They shall file, in the offices of the clerks of the towns in the territory to be affected a copy of the rules and regulations adopted by them and publish the same three weeks successively in a newspaper printed in the county, and post on the banks of waters to be affected, as nearly as may be like notices, and whenever any such rules or regulations apply to any organized township, a like copy shall be filed with the clerk of courts for that county, and published three weeks successively in a newspaper printed in the county they shall, immediately upon the adoption of any rules and regulations contemplated by this section, file an attested copy of the same in the office of the Secretary of State. (Provides penalty, maximum one hundred dollars.) (P. L. 1915, Sec. 15.)

It will be seen from the following that the proposed California law attempts to make use of the best provisions found in the laws of other states. It does not deprive the legislature of its right to legislate on game but simply provides that temporary changes may be made in emergencies. The following provision can be best inserted in the law by the addition of a paragraph to Section 642 of the Political Code relating to the duties and powers of the Fish and Game Commission.

Whenever, after due notice and hearing, it shall appear to the board of fish and game commissioners that any species of mammal, bird or fish of the State of California is threatened with extermination by reason of disease, excessive hunting or fishing, or any other cause, or that it is necessary to assist in the increase or better protection of any particular species of mammal, bird or fish, or that it is desired to introduce into this state any new species of mammal, bird or fish, the board of fish and game commissioners shall have power to regulate by suspending, shortening or lengthening the open season and by modifying restrictions on the mode of taking or the amount taken of such species of mammal, bird or fish, in any designated area, or waters, or stream, or part thereof, of this state, for a period not exceeding two years at one time, or until such time as new legislation thereon enacted by the state legislature shall become effective. During the suspension of any open season by the board of fish and game commissioners, all provisions of law relating to the closed season for such mammals, birds or fish shall be in force, and every person who violates any such provision shall be subject to the penalties prescribed therefor. Any order issued under authority hereof shall become effective on approval of the Governor of California and shall contain a description of the area, waters, stream, or parts thereof, affected, the time when it becomes operative and the period during which it shall be effective, and a copy thereof shall be published in at least one newspaper of general circulation in each county within the district or any part of the district in which the regulation or order shall apply, at least once a week for two successive weeks, and a certified copy of such order shall be filed in the office of the county clerk of each of said counties.

CONCLUSION.

1. It is apparent that under the present system the hands of the Fish and Game Commission are tied and that this body is powerless to give fish and game added protection in time of emergency.

2. The present situation can be improved by the passage of legislation giving the Fish and Game Commission discretionary powers.

3. With power to suit protection to each locality when unusual conditions arise, greatly improved results may be expected.

4. The feasibility of a law giving discretionary powers is evidenced by the successful operation of similar laws in other states.

5. Three important things can be accomplished by giving the Fish and Game Commission discretionary powers:

a. Legislation can be suited to the requirements of localities rather than whole districts.

b. Increased protection can be immediately afforded fish and game whenever unusual circumstances warrant it.

c. Increasing complication of the districting law can be remedied.

6. A law allowing discretionary powers in the administration of fish and game is the game law most needed at the present time.

CALIFORNIA'S "BIT."

By JOHN N. COBB.

While the commercial fishermen of all the states in the Union have been doing their "bit" in trying to replace the much needed meat and other food products sent to our allies on and near the fighting line, those of California have especially covered themselves with glory in this regard as the following comparison of fishery products produced in 1917 with certain other years plainly shows.

The United States census of 1908 showed a production by the commercial fishermen of California of 47,477,000 pounds, valued at $1,970,000. A later investigation of the United States Bureau of Fisheries showed that in 1915 our commercial fisheries produced 92,513,457 pounds, valued at $2,488,098, while reports made by the commercial fishermen to the California Fish and Game Commission for the twelve months ending September 30, 1917, and other sources, show that 1,000,020,428 pounds, valued at $7,697,598, were produced. This latter comprised 178,450,472 pounds of edible fish, valued at $5,353,514; 23,757,782 pounds of other edible fishery products (such as mollusks, crustaceans, etc.), valued at $2,138,190, and 797,812,174 pound of non-edible products (mostly kelp), valued at $205,894.

Arranged in tabular form the three years in question show as follows:

Year	Pounds	Value
1908	47,477,000	$1,970,000 00
1915	92,513,457	2,488,098 00
1917	1,000,020,428	7,697,598 00

The data given above represents the products as landed by the fishermen, and the value is that realized by them. A large number of canneries and other plants receive a considerable part of the products so landed and prepare them in various ways for shipment and sale throughout the world, the value of the products increasing many fold in these operations. The enormous amount of kelp gathered in California waters and utilized at the immense plants established in the southern part of the state since the outbreak of the war, is valued at only about $200,000, although when the potash and other chemicals are extracted their value runs into millions of dollars.

As a result of the efforts of our fishermen, California now occupies first place, so far as quantity produced is concerned, amongst the various states of the Union, Virginia, with 494,959,362 pounds, being a very poor second, and is surpassed in value of its fisheries by Alaska, Massachusetts, and Maine alone, in the order named, with values of $8,413,713, $7,992,756 and $7,742,647, respectively.

The total fishery production of the United States amounts to about 3,950,000,000 pounds, valued at approximately $84,500,000, and of this enormous production, the greate t by any nation, California produces about one-fourth of the quantity and about one-eleventh of the value.

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All material for publication should be sent to H. C. Bryant, Museum of Vertebrate Zoology, Berkeley, Cal.

July 15, 1918.

"To the profiteering proposal of the Pseudo-Patriots, the Patriots for revenue only, that protection of wild life in war time be relaxed, the united hosts of conservation reply:

'YOU SHALL NOT PASS.'

"Let this be the slogan of every farmer, of all who dwell in the open, and of all who love nature and who wish to see our natural resources preserved for the perpetual use of our people and not destroyed for all time to gratify the greed of a moment."—Theodore Roosevelt.

KELP.

We have long realized the value of our fishery resources, but we have just begun to find out that there are other products of the sea which can be utilized. That the vegetable life, as well as the animal life, can be made a source of profit is shown by the kelp industry. Formerly used only for the making of souvenirs, the common kelp of the southern California coast is now the basis for the manufacture of potash, a material important in the manufacture of fertilizers and just now a necessary component of war ammunition. In recognition of a new and important industry, and in order to acquaint our readers with interesting facts related to the industry, we are issuing this "Kelp Number."

WHO'S TO BLAME?

To hear some persons talk one would think that the Fish and Game Commissioners were among those most to be detested. Some persons apparently even have a personal grievance against the men themselves. The truth of the matter is that such persons talk disparagingly of the Fish and Game Commission simply because the commission enforces the fish and game laws. It will be seen also that the professional agitators are almost always those who are commercially interested in fish and game.

Some statements made lead one to conclude that the Fish and Game Commission makes the game laws and that it alone must be held responsible for any disturbing provisions. Of course, this is not true. The legislature is entirely responsible for fish and game laws. One function of the Commission is to enforce these laws, and consequently it must stand along with other bodies which enforce the laws and be the subject of continual criticism. No matter how faithful a Fish and Game Commission may perform its duties it must still be the recipient of vituperations without number.

It is remarkable how many people believe that a law can be repealed or amended by attacking the Fish and Game Commission. Exactly the opposite attitude will bring the best results, because there is no better way to secure the repeal of a bad law than to rigidly enforce it. The state constitution provides for the initiative and recall, and relief is always possible by utilizing the lawful means at hand.

TALK VS. ACTION.

Statements to the effect that the game laws are not being enforced are far too common. Letters are constantly written to newspapers and statements made in public regarding known violations of the game laws. If the persons making these statements would be half as active in reporting violations to the proper authorities as they are in giving publicity to violations, conditions would be greatly improved. For some unknown reason people take delight in pointing out violations, but when asked to swear out a warrant for the arrest of a violator they immediately say, "Let George do it." A game warden can not always be on the spot when a game law is violated, but he can reach the spot and make a conviction if the proper information is furnished

him. When unselfish persons take an active interest in the enforcement of game laws we will hear fewer statements regarding alleged violations, and game will receive proper protection.

SHAD BECOME SCARCE.

As predicted by the Fish and Game Commission, the shad catch has been far below normal, owing to excessive fishing of the past few years. Five years ago shad fishermen were able to catch 5000 pounds a day. They obtained but fifty cents for a 200-pound box. Three years ago fishermen obtained one-half cent for buck shad and two cents for roe. This past year the average catch made by a fisherman is about 400 pounds. He now obtains three cents a pound for buck and five cents for roe shad.

FISH ESCAPE FROM BOULDIN ISLAND.

The completion of a levee around Bouldin Island, on the Lower San Joaquin River, impounded great numbers of bass and shad, as the island has been under water for some time. Fearing that large numbers of valuable food fish would be destroyed because unable to reach the river, the Fish and Game Commission decided to allow fishermen to take the fish in nets. The island was opened to fishermen at 9 o'clock on May 21, and many fishermen from Pittsburg were on hand. After all of the work of laying the nets, one of the largest catches noted was composed of two shad and two carp. The fishermen were quickly convinced that all of the fish had escaped and left immediately for other fishing grounds. Thus ended the controversy as to the large numbers of food fish which would be destroyed when the levee was completed. It may be necessary at a later time to rescue some of the smaller fish which have been impounded, but it has been clearly demonstrated that the food fish have already escaped into the river.

A DANGEROUS STATEMENT.

The following is an extract from an editorial which appeared in a leading newspaper of San Francisco:

"This much is certain that there is a lot of nonsense talked on the subject of game preservation. In whose interest is it protected? Not in that of the great mass with little opportunity for indulging in the luxury of killing things and in no way benefited by game as a table decoration. Nor is it in the interests of those engaged as farmers or fruit growers. That birds included in the protected list are destructive of crops can not be denied, and as our established rural industries are of infinitely greater importance than the pastime of sportsmen or the sentimentalities of the nature-worshipers our game laws should be amended so as to permit the destruction of all destructive creatures."

We trust that our readers are not convinced of the truth of these statements. Let us analyze some of them. Many persons are impressed by statements calling attention to the fact that the poor man has little chance to secure wild game. The fact is that the poor man has a far better chance of obtaining and utilizing game for food than in obtaining his share of use in public roads, public parks and public buildings, all of which belong to the people and for which each citizen is annually taxed. The utilization of these latter assets are far more dependent on wealth than is game.

What if we applied the rule suggested in the last statement that all destructive creatures be destroyed? We would soon discover that we were "cutting off our noses to spite our faces," for if everything has its rightful place in the balance of nature then the more creatures that are destroyed the greater is the balance upset. Controlling wild creatures is a different thing from destroying them utterly. Then, too, it must be remembered that some of our bird and animal pests do not rightly belong in our fauna. The house rat, house mouse and English sparrow are deserving of extermination. Native animals and birds may need to be controlled so that our interests may be cared for, but they are deserving of perpetuation, not of extinction.

Every conservationist must help point out the fallacy of such arguments. Anyone who reads the game laws knows that the farmer is definitely given the chance to protect his crops.

WAR PROFITEERS.

New evidence of operations of selfish interests which profit in the present emergency at the expense of wild-life conservation comes in daily. One of special importance that has come to our notice is a petition sent Food Administrator Hoover by two United States senators, and signed by many Montana men, urging the killing of all elk in Yellowstone Park.

Fig. 75. Trout, 159 in number, weighing 28 pounds, confiscated by Deputy Gyger from two violators, on the south fork of San Jacinto Creek, April 14, 1918. The fish were taken with flies out of season.

IS THIS JUSTICE?

Achille Paladini and W. S. Stewart, agent of the Glacier Fish Company of Pittsburg, were arrested recently on the charge of shipping 5000 pounds of striped bass out of the state. The men were convicted and fined $50 each by Justice of the Peace Jackson of Concord, Contra Costa County. We wonder what effect so small a fine will have on such a chronic offender as Paladini. Mr. Paladini cleared at least $000 on the striped bass transaction. What difference would it make to him if he had to pay $50 from his profits in paying a fine?

STATE PLUMAGE LAW EFFECTIVE.

The new law prohibiting the sale of aigrettes, plumes and like feathers has effectively stopped the commercialization of the plumage of birds in California. The first case made under this law resulted in a fine of $15 for the sale of a bird of paradise. The defendant was A. Larson, Jr., wholesale millinery dealer of Los Angeles. The excuse that he had secured the feathers before the law took effect had no weight with the judge.

UNITED STATES FOOD ADMINISTRATION MEMORANDUM ON THE USE OF GAME AS FOOD.

The problem of providing for the country a maximum supply of game as food has been carefully considered by the Food Commission. It has reached the conclusion that this maximum supply can best be obtained by constantly increasing the breeding reserve of game under present and even more progressive laws directed toward that end.

Up to a short time ago no fact is more clear than that the game of the country has been decreasing, some species even approaching the point of extinction. That the energies of the whole country have been directed toward increasing the stock of game is demonstrated by the fact that many state legislatures have decreased the amount of the game to be killed by individuals and shortened the seasons in which game could be killed. Notwithstanding these efforts, the decrease in game became so serious that a universal demand throughout the country persuaded Congress to pass a law placing the jurisdiction of migratory game birds under federal supervision. Canada passed through the same experience, as is proved by a treaty negotiated with the United States practically incorporating the terms of the migratory bird law passed by Congress. The result of better state laws and the migratory bird law has been a positive increase of waterfowl and a wide extension southward of the breeding of waterfowl. It is perfectly clear that this increased breeding reserve gives more individual citizens the opportunity to kill for food more game, which opportunities must necessarily increase each year proportionately to the increase of the breeding reserve.

Any effort to weaken the present laws or in any way relax them in one locality would immediately lead to a demand for such relaxation of laws in all other localities, insuring a rapid breakdown of the whole legal structure of present game protection erected after efforts extending over numerous years. Once the perfected laws were relaxed to the point where game could be killed more freely, notwithstanding the fact that numerous gunners have gone to war, the game would be quickly destroyed by largely increased

numbers of local gunners using modern methods of transportation, such as automobiles, motorboats, trolley roads and improved firearms. The present game supply of the country should be considered in exatly the same way as that of domestic stock and fowls, the breeding reserve of which should be increased to insure increased supplies for food. This is even more necessary for much of the wild game, since once it is destroyed to a certain point it will decrease under natural conditions to extinction and can never, as in the case of domestic stock, be restored.

To advocate the relaxation of state game laws would secure neither uniformity in action or results since state legislatures can not be brought to exactly the same views, and most of the states will not have regular sessions for another year. Since an attempted relaxation of laws would tend toward a rapid destruction of game, no emergency has as yet arisen sufficiently acute to warrant the Food Administration advocating the destruction or impairment of game which forms a valuable natjonal asset.

It may be added that no extensions of the hunting season or bag limit beyond those now specified in the state game laws could be legally made without action by the state legislatures, most of which will not meet until a year from the coming winter. Furthermore, an action which could be taken in this country which would contravene the Migratory Bird Treaty between the United States and Great Britain as concerns the conservation of wildfowl would be deeply resented by Canada, which through considerable effort has secured the acceptance of all the provinces of the treaty and of the enabling act and regulations whereby it is to be enforced.

U. S. Food Administration.

HOW TO HELP.

There are many persons sufficiently interested in wild life to seek some way of helping in the conservation movement. Believing that one of the most fundamental methods of bringing about conservation in the future is to begin with school children, we are led to make the suggestion that such people demand that wild-life conservation be taught in the schools of their respective towns or cities. A talk with the principal or with the teachers will oftentimes accomplish the right end. The ability to properly teach nature study and wild life conservation should be demanded of every prospective teacher.

LIMITS THE RULE.

The opening day of the 1918 trout season demonstrated that fish are even plentiful in the coastal streams near San Francisco. One of the fish and game deputies, working near Pescadero, San Mateo County, checked over forty-two limits of trout, and many other fishermen had very near the limit. The fish were not very large, but of sufficient size to make them the best kind of food.

THE POLLUTION OF PUBLIC WATERS.

The pollution of the public waters of the state has become a serious menace to fish life, and the Fish and Game Commission has for a number of years been using the powers given it by the legislature to stop this wanton destruction of fish.

Large quantities of fish in San Francisco and San Pablo bays are often so charged with petroleum that they are unfit for food. The principal offenders are the refining companies on the shores of San Francisco and San Pablo bays. The companies have been warned from time to time regarding this evil and have promised to stop the pollution, but, with few exceptions, have failed utterly to keep their agreements. They have been arrested numerous times and with but one exception have escaped punishment upon the promise to the court that the evil would be remedied. The defense frequently advanced by the several offending companies has been that the industry is more important to the people than the fish. Both are economically important, but the importance of one is no excuse for the destruction of the other, for it has been shown conclusively that the evil complained of can be remedied without impairing the operation of the plant. This has been demonstrated in almost every instance, for, as soon as an arrest

is made, the pollution is stopped temporarily, and then is continued again with greater aggravation. Consequently, if it can be stopped temporarily, it can be stopped permanently.

Another defense frequently advanced is that the expense of disposing of the waste oil, other than in the public waters of this state, is too great. Certainly it can not be contended that the money expended by any oil company to prevent this pollution would represent, in the smallest degree, the value of the fish destroyed.

There are only a few of nature's gifts which have not been appropriated and exploited by corporate greed and which the public are privileged to enjoy. These are air, fish and game, and, regardless of expense, they should be perpetuated.

One of the best illustrations of the willful and malicious pollutions to which the attention of this commission has been called is that of two oil companies operating on Edna Creek in San Luis Obispo County. This stream is one of the largest and best trout streams in the county. For some time the companies on its banks have run their waste oil into the creek, polluting it for many miles, so charging fish with oil as to make them unfit for food, and making the water unfit to drink, either for man or beast. The companies have been warned numerous times to cease polluting the water of Edna Creek, which warning they have failed to heed, and as a result they were arrested recently and convicted and fined. Within twenty-four hours after they were convicted, the pollution ceased, and the sump holes, from which pipes and ditches lead into the creek, were filled in or disconnected.

This same condition prevails along the shores of San Francisco and San Pablo bays.

The pollution of the public waters can and must be stopped. The people demand it and it is absolutely necessary for the preservation of the fish life in waters of the state. The Fish and Game Commission will do all in its power to enforce the laws upon the statute books governing this subject, and it is the duty of the courts to see that the mandates of the law are carried out.

This, however, can not be done without the earnest assistance and co-operation of the several district attorneys throughout the state, who have in some instances failed to give the assistance which the importance of the subject demands.—ROBERT D. DUKE.

HOW SAN FRANCISCO BACKS THE GAME LAWS.

There has been great improvement in the co-operation of the judges of this state in enforcing the fish and game laws. There are only a few places where it is still difficult to obtain convictions. One such place is San Francisco. Records compiled by the Fish and Game Commission show that during the last three years but twenty fines, and these for small amounts, have been imposed by the police courts of San Francisco on violators of the fish and game laws. During the same length of time, only five violators were sent to jail, while thirteen cases were dismissed and fifty-three convicted persons were let go with suspended sentences. The record also shows that a large percentage of those who were fined or jailed were Chinese. All but ten of the eighty-nine violators appearing in court were foreign born.

The record compiled is worthy of consideration. This commission does not expect the fishermen to be branded as felons or anything of that sort. It seeks from the courts in convictions, punishment which will deter the market fishermen from despoiling the fish supply. The law is not drastic. It aims to protect in a perfectly sane way the fish and game food supply of the state. When the commission presents evidence that warrants conviction, it stands to reason that if the convicted person is let off with a suspended sentence which means no punishment at all, the very purposes of the commission's work are hampered seriously.

If for profit market fishermen or game hunters are wilfully violating laws which they know exist, the Fish and Game Commission should be sustained in its endeavor to enforce these laws.

SAN DIEGO COUNTY NOW HAS TROUT FISHING.

The lack of year-round streams has driven San Diego County anglers to other localities in the past, but now all is changed. Cuyamaca Lake, bone dry in 1913, is now the scene of some of the best fishing in the state.

The results of the present trout season at Cuyamaca Lake clearly demonstrate the value of the hatchery work of the Fish and Game Commission. In 1915, 2500 trout sent from the State Hatchery were planted in the lake. This was purely an experiment and the anticipated results were doubtful. Thousands of trout from the State Hatchery and some furnished from the exhibit of the United States Bureau of Fisheries at the Exposition have been added in the last two years. Now the fish crop is ready to be harvested. On the opening of the trout season in May, two limits were taken. One bag contained a six and one-half pound rainbow trout which was twenty-two inches long and seven inches wide and took twenty-five minutes to land. All other trout taken here have been steelhead, weighing from one and one-half to six pounds, and good catches have been made all during the season. The larger fish had roe nearly developed and the males contained milt. Since no schools of small fish have been found near the shore it is believed that the trout are spawning in the lake.

Cuyamaca Lake has been fed solely by rains and snows which drain into the basin. Due to dry winters, the lake became dry in 1913. Since that time a dam has been built and it is very unlikely that it will dry up again.

Due to effort on the part of anglers and intelligent and effective work of the State Hatcheries every county in the state may now boast of trout fishing. Ideal water and food conditions have produced splendid large fish within a short time, and Cuyamaca Lake will henceforth be a favorite camping place for San Diego anglers. These unlooked-for results have shown the efficacy of the state's method of augmenting the fish supply by propagating trout in hatcheries.

Fig. 76. Trout caught on opening day of season in Cuyamaca Lake, San Diego County. From left to right: Mr. Webb Toms with 3-pounder, Mr. Jack E. Thornton with 3 and 4 pounders, and Mrs. J. E. Thornton with 6½-pound rainbow, the largest catch of the day.

SQUIRREL CAMPAIGNS AND QUAIL.

Several complaints that quail had been poisoned in the squirrel campaigns being instituted in many counties have reached the Division of Rodent Control of the

State Commission of Horticulture. Mourning doves sometimes are victims of poison put out for squirrels, but there is little direct evidence that quail are poisoned. The government formula is being used almost exclusively, and the United States Public Health Service showed by a series of experiments that quail can take five or six times as much poisoned barley as a ground squirrel and show no effects. (See "The Effect of Strychnine Sulphate on California Valley Quail." Calif. Fish and Game, Vol. 2, pp. 11-13.) The experiments demonstrated that valley quail may be fed relatively large amounts of strychnine sulphate without toxic symptoms and that poisoned barley as used in ground squirrel eradication does not cause the death of California valley quail under natural feeding conditions.

RESEARCH PROBLEMS OF THE CALIFORNIA FISH AND GAME COMMISSION.

Although depending largely on the results of scientific investigations carried on by universities and professional investigators, the California Fish and Game Commission is actively engaged in solving some of the problems connected with the administration of fish and game resources. The greater the basis of fact the more sure is proper legislation. Facts suitable as a basis for legislation are obtained by careful research work. Some of the early experiments in tagging salmon and trout furnished dependable evidence as to the importance of these fish and furnished a splendid basis for legislation. Experiments carried out by the state hatcheries have greatly improved methods.

A summary of the investigations now under way will demonstrate the fact that the commission is attacking problems in a systematic and scientific way.

Department of Commercial Fisheries.

In order to solve problems connected with the fisheries, a trained investigator, Mr. Will F. Thompson, a graduate of Stanford University and formerly an official investigator for the British Columbia Fishery Department, has been employed. Mr. Thompson is devoting his full time to the solution of the problems connected with albacore and albacore fisheries. He has already been able to report that there is a correlation between temperature and the catches made. Much evidence as to spawning of this fish and the age as demonstrated by microscopical examination of the scales has been compiled. This investigator will next turn his attention to the herring and the herring industry. A full laboratory equipment has been furnished for this work.

Examination of many specimens of fish of different kinds to demonstrate the time of spawning has also been carried on by the department. Plans have also been made for some tagging experiments, so that the life history of the salmon may be better known.

Department of Fish Culture.

Although no definite investigations are now under way, the outcome of several fish transplanting experiments are being awaited with interest. Golden trout have been transplanted and it will be possible to demonstrate whether these brightly colored fish will change in coloration when changed to other localities. Other similar experiments dealing with steelhead trout have been instituted.

BUREAU OF EDUCATION, PUBLICITY AND RESEARCH.

A part of the time of the director of this bureau has been directed to the study of the food habits of birds. An investigation of the food habits of the roadrunner has been completed. The roadrunner has been accused by sportsmen of destroying nests and young of the valley quail. Eighty-three stomachs of roadrunners were examined, the contents tabulated, and a full report published. The last year has been devoted to the food habits of ducks in California. Hundreds of duck's stomachs have been examined and it will be possible to show which are the best food plants for attracting waterfowl.

In addition, studies have been made as to the relation of certain birds and animals to agriculture, and evidence on the breeding of ducks and other waterfowl has been collected. Information on the game birds and mammals of the state is being systematically collected and filed so that it will be available for further work.

WILD LIFE FILMS.

The wild-life films used in the educational work of the commission continue to be popular. There is sufficient demand to keep them busy most of the time. Many high schools are availing themselves of the opportunity to use these pictures. Organizations desiring to use these films this coming fall should secure dates immediately from H. C. Bryant, Museum of Vertebrate Zoology, Berkeley, Cal.

SHOOTING THE MOVIES.

The casual visitor to a shooting gallery displaying the sign, "Shooting the Movies," would be led to think that the old-time shooting gallery, with its moving array of ducks and deer, had been displaced by a regular moving picture, which gives a man a chance to shoot a real picture of the wild game which he shoots in the open. It is true that moving pictures of wild game now form the marks for the customers of a shooting gallery, but few persons realize the complicated electrical system needed to make this sort of shooting possible. A man shooting at objects in a moving picture would soon discover that almost before he pulled the trigger some other object would be in view. In order to make it possible to actually see where the animal has been hit, a complicated electrical system is necessary. The system is under Swiss patent and the controlling mechanism is a microphone. The report of the gun is recorded by the microphone, which in turn operates electrical devices which instantly stop the projecting machine, allowing the one shooting to see exactly where the animal is hit, and then automatically start the projecting machine again. The same system automatically changes the paper background of the picture, covering up the bullet hole and so prepares the target for the next shot.

At the beginning of the war the British Government became interested in developing some device for giving rifle practice to prospective soldiers. Fifty thousand pounds was set aside, and finally the electrical devices necessary to make "shooting the movies" possible were developed. Apparatus of this kind is now installed on the larger battleships, in aero stations and in training stations. Moving pictures of submarines and periscopes form the targets for those on board ship, whereas, soldiers going over the top often form the target at training camps.

The present apparatus has been perfected after eighteen months of work and is proving very satisfactory. Lubfin & Butler have opened a shooting gallery of this type on Market Street in San Francisco and the same firm expects to introduce this new sport in all of the larger cities of the West. Needless to say, this new sport develops the ability to shoot quickly and accurately.

NOT APPRECIATED HERE. SHAD ARE SHIPPED EAST.

The shad is one of our best food fishes, but only easterners appreciate the fact. We can buy a shad for twenty-five cents, which the easterner gladly pays one dollar or more to obtain.

No man may say why one fish finds a market, and another, and perhaps a better one, does not, but apparently in the case of the shad the reason it is not appreciated is that it is cheap. One hears the statement on all sides nowadays that fish food is so expensive people can not afford to eat it: and still they buy the expensive fishes when the cheaper ones are often (nay, usually) superior to them (the salmon always excepted). When our shad was not yet abundant it sold for from twenty to twenty-five cents a pound, and the demand was great. At this time money had about twice the purchasing power it has now. But before this the price was still higher, for it sold for a dollar and a dollar and a half a pound, and in some instances single fish brought ten and fifteen dollars! As the fish became more and more abundant the price dropped to ten, to five, and even to two cents a pound. At this price it became very unfashionable to eat shad.

You may argue that this does not bear out the assertion that if the shad was more expensive it would be better appreciated, for, you may say, it only shows that people have become tired of it. But on the Atlantic coast, where the shad came from, people have not tired of it. Quite the contrary. And now the point that proves the statement: From 80 to

30 per cent of our shad was shipped east last year, about 67 carloads in all, much of it going to the Atlantic seaboard, where the local supply was not great enough to supply the demand. There it sold at a price that commanded consideration and that placed it in a class of undoubted respectability. So this fish that we do not value appears, after a journey of over 2,000 miles, on the table of the epicure. Planked shad has been a tradition on the Atlantic coast since the time of George Washington, and anyone who may have been elected by the gods to eat planked shad at Marshall Hall, near Mount Vernon, will remember the occasion with reverence. It is commercially the most valuable food fish on the Atlantic coast.

We complain that the shad is bony. That is freely admitted. It is very bony, but it is just as bony when it arrives on the east coast, and people there are only too glad to remove the bones for the sake of the savory reward. It is not inconceivable that part of the flavor results from the trouble of removing the bones. That which comes without effort is usually not worth while. However, a little experience will teach one to remove the bones with very little trouble.

The shad passes most of its life in salt water, but annually migrates to fresh water for the purpose of spawning. It is during its migration up the rivers that it is caught, though a few are taken in the ocean. Little is known of its life in the ocean, and little is known of its food, for it eats scarcely at all while in the rivers. Furthermore, our shad does not naturally belong to the Pacific coast fauna. Several times between the years 1871 and 1880 young shad were shipped from the Atlantic coast and planted in the San Joaquin and Sacramento rivers. Now it is one of our abundant fishes.

The shad is doubly a cheap fish at present, for it is oily enough to require very little additional fat in cooking. But it will not remain a cheap fish when it is appreciated, for the supply will not stand a great demand here any more than it has on the Atlantic coast.

The shad season is now on. Let us keep for our own consumption this excellent fish. Sending our shad east is admitting that we lack epicurean education.

Try it baked: Season fish well with salt and pepper and sprinkle lightly with corn flour. Lay it on a flat baking dish and spread over it about a teaspoonful of oil or meat drippings. Bake in a brisk oven from 20 minutes to a half-hour, basting occasionally with a little milk and water, or with just water. Serve with lemon or tartar sauce. In a gas oven the fish may be placed under the flame and turned over.

COMMITTEE ON ZOOLOGICAL INVESTIGATIONS, CALIFORNIA STATE COUNCIL OF DEFENSE.

CHEAP FISH ARE OFTEN THE BEST.

With the exception of the salmon there is scarcely a fish that is expensive because it is good. The salmon is worth all that is asked for it at its highest price. It is not a cheap fish, nor should it be, for there is a market for every salmon that is caught, even if it never appeared in the fresh fish market.

Though people think of the sardine more as a canned fish, it is, if used fresh and fried, or broiled, or baked, one of our most delicious fishes. (Do not let the market-man sell you herring for sardines. The sardine usually has dark spots on the side, but not always. But it always has fine raised lines or ridges on the gill cover that extend downward and spread out fan-like.) In San Francisco the sardine may be had for five cents per pound, and it should be had that cheaply everywhere in the state where the demand is great enough to enable the dealer to order a 100-pound box at one time, for the fishermen receive less than a cent a pound for it (from $10 to $18 per ton).

The striped bass retails in San Francisco at five times the price asked for the sardine. Now, it is a dangerous thing to assert that one of two good fishes is the better, for tastes differ more perhaps in fish food than in other food. Some like a rich, fine-fleshed fish, while some prefer a drier, coarser fish; some like one flavor, some another. It is a case of Jack Sprat over again. The writer (and he is not alone in this opinion) would prefer the sardine even if the above prices were

reversed. But the supply of the striped bass is very much less than that of the sardine. Last year's catch of sardines exceeded a hundred millions of pounds on our California coast. Everyone knows the striped bass. It is a game fish that sportsmen pay good sums of money to go fishing for, and when people hear that the market-man has striped bass they think it must be a particularly good fish, for they have heard so much about it. When they learn the price they feel sure that it is the best. On account of this demand the fishermen received from ten to fifteen times as much for the striped bass as they do for the sardine.

Not only do we pay much more for such expensive fishes, but because we demand them we increase the price of the cheap fishes on account of more expensive waste. Figure it this way. A wholesale dealer pays $15 for 100 pounds of striped bass. He pays $1 for 100 pounds of sardines. He may lose sometimes on an off day as much as 25 per cent of his fish. Of course, this excessive waste is very unusual, but it will illustrate what we wish to say. Thus he loses $3.75 on his striped bass and 25 cents on his sardines, and as he has to average his loses to some extent the cheap fish have to bear more than their share of the burden and are no longer cheap fish.

To put it briefly, if we ate only the plentiful sorts of fishes the price could be made much less, for if the dealer did not have to handle the expensive sorts his loss would be less.

There are other cheap fishes besides the sardine that are good: the rex-sole, the shad, the sablefish, the mackerel and others. We have picked out the sardine to compare with the striped bass only because of its abundance. It should always remain a cheap fish.

COMMITTEE ON ZOOLOGICAL INVESTIGATIONS, CALIFORNIA STATE COUNCIL OF DEFENSE.

FEW ELK IN 1859.

The following interesting item relative to the killing of an elk in the vicinity of Stockton is doubtless of far greater interest to us at the present than it was to the readers of the "Stockton Argus" in 1859. It can be seen that even at this date the elk had become practically exterminated in the San Joaquin Valley. We are indebted to Mr. William Cohen for the item:

"An elk weighing some 425 pounds was brought to Stockton on 25th October from Middle River, where it was killed on Saturday last by Robert Dykman, the hunter, to whose superior skill with the rifle we are indebted for the larger portion of game of this description that finds its way into our market. Mr. Dykman was three days upon the trail, in which time he followed his game from near the mouth of the Mokelumne, across the San Joaquin and Middle River, a distance of about thirty-five miles. The horns were some six feet in length, with antlers, the longest of which were eighteen inches. The head and horns weighed 75 pounds, which were retained here, and the remainder shipped to San Francisco, where the scarcity of cervine provision commands for it a higher price than could be obtained in our own market.—*Stockton Argus*, October 25, 1859.

SALT FOR DEER.

Some salt bricks were furnished forest officers in Trinity County by the Commission in 1915. The deer made good use of this salt after they had become accustomed to the bricks. The forest officers who made this experiment, as well as others familiar with wild life, believe that much greater utilization of the salt would have resulted if ordinary loose salt had been provided. Salt in this form could be placed on logs by squaring off one side and boring two-inch auger holes five-sixths of an inch deep and filling these with salt. The salt logs might be cut where cattle do not ordinarily travel and additional safety would be furnished by the small holes from which salt cannot be licked so easily by a cow.

There is a real necessity for salting deer. It is, of course, well known and recognized that cattle absolutely must have salt to grow in weight and to remain healthful. As deer have always used licks, it is assumed that this method of salting is satisfactory.

One of the advantages of salting deer is that they do not have to leave the high feeding grounds to travel a long distance to some lick that is usually near a stream at some low elevation, with little feed in

the near vicinity. Other deer linger near the licks and usually are in poor condition because of the lack of feed.

In getting the small amount of salt in the licks, deer get a large quantity of earth which, if not injurious, is certainly not healthful. Licks are not in as good condition as they were before so many stock were grazed, for cattle trample all around and through the licks, mixing the salty deposits with the clay or other dirt. It appears certain that the deer, with their smaller feet and some instinct for continued use of the licks, make regular trails and keep the saline part of the licks more free from foreign matter. So far as hunting at licks is concerned, no more of this would be done at the artificial licks than at the natural licks. Salting deer is necessary, and the commission should furnish and distribute 2,000 pounds of salt annually in Trinity County.—E. V. JOTTER.

FAIR PLAY.

(A page of criticisms and answers.)

WANTS SALE OF TROUT.

San Francisco, June 1, 1918.

Mr. Carl Westerfeld,
Executive Secretary,
State Fish and Game Commission,
San Francisco, Cal.

My dear Mr. Westerfeld: I am in receipt of a communication from one Jack Lloyd of Pine Knot, Los Angeles County, who writes that there are thousands and thousands of big trout in Big Bear Lake which he says could be sold at reasonable rates in Los Angeles. Lloyd writes that there is no limit to the fish in the lake at the present time, and inasmuch as he has written me asking to know how this supply could be made available for the fresh market commercially, I am writing to you without comment, although I would be glad to have your opinion on the matter.

Yours very truly,
(Signed) F. N. BIGELOW,
Secretary.

SALE OF TROUT PROHIBITED.

San Francisco, June 4, 1918.

F. M. Bigelow, Esq.,
Sec. State Market Commission,
No. 606 Underwood Building,
San Francisco, Cal.

My dear Mr. Bigelow: Your letter dated June 1, advising me that you had received a communication from Jack Lloyd of Pine Knot stating that there are thousands and thousands of big trout in Big Bear Lake which could be sold at reasonable rates in Los Angeles, is now before me.

Jack Lloyd is a market fisherman. On October 19, 1917, he was convicted for having over the limit of trout in his possession and paid the fine of $25 imposed by the judge.

Big Bear Lake is an artificial lake in San Bernardino County, about eight miles long and a mile and a half wide. It was stocked with fish by the commission and is one of the favorite fishing grounds in southern California. From 50,000 to 100,000 tourists go there every year for recreation and sport, being attracted largely by the fishing. At the request of these people a bill was introduced at the last session of the legislature prohibiting the sale of trout. It had the unanimous support of the representatives from southern California, and after a most thorough discussion passed both houses of the legislature and was signed by the Governor.

At the time the bill was before the legislature I had the pleasure of hearing all the arguments, pro and con, and thoroughly agreed with those in favor of the bill, particularly in its relation to Bear Lake, which is a small lake and would in a short time be depleted of its fish if market fishing were permitted to continue, thus depriving many, many thousands of people of the only real good trout fishing to be had in southern California.

It seems that every market fisherman, commission merchant and profiteer has attempted to set aside the restrictions passed for the conservation of our fish and game. The best answer to those men

as Col. Roosevelt's message, which reads as follows:

"To the profiteering proposal of the pseudo-patriots, the patriots for revenue only, that protection of wild life in war time be relaxed, the united hosts of conservation reply:

"You Shall Not Pass.

"Let this be the slogan of every farmer, of all who dwell in the open, and of all who love nature and who wish to see our natural resources preserved for the perpetual use of our people and not destroyed for all time to gratify the greed of a moment."

Yours very truly,

(Signed) CARL WESTERFELD,
Executive Officer.

FACTS OF CURRENT INTEREST.

The enabling act of the Federal Migratory Bird Law was finally passed on June 6, 1918; the greatest piece of game protective legislation in the world is thus brought to completion.

✣ ✣ ✣

Two Austrian fishermen have been arrested in southern California under the Wood Act of August, 1917, for dumping overboard twenty tons of barracuda. Such wanton destruction of valuable food is now a criminal act.

✣ ✣ ✣

The site for the new Yosemite Hatchery has been selected and ground will be broken soon.

✣ ✣ ✣

On May 7, 1918, the Western California Fish Company of Pittsburg, California, secured a salmon weighing 67 pounds.

✣ ✣ ✣

The counties of Marin and Yolo each pay a bounty of $20 on coyotes and Solano and Sutter each pay $10.

✣ ✣ ✣

Paladini, the fish dealer so often accused of monopolizing the wholesale fish industry of San Francisco, has been arrested for shipping striped bass out of the state.

✣ ✣ ✣

The attempt to breed ducks for the market recently made by A. Schilling, has been abandoned. The large game farm near Newark, Alameda County, was the largest of its kind in the state.

✣ ✣ ✣

Striped bass have been plentiful this spring and have sold as low as seventeen cents per pound. The abundance is doubtless due to the added protection this fish has received the past three years.

✣ ✣ ✣

Large numbers of fish have died in the Kern River near Bakersfield, probably because of low water. Fortunately these fish were not valuable as food.

✣ ✣ ✣

The lowly jackrabbit has become so important a food item that the price has been increased in the markets.

✣ ✣ ✣

The shad catch this spring has been below normal due to overfishing the past few years.

HATCHERY NOTES.

W. H. SHEBLEY, Editor.

FRY DISTRIBUTION BEGINS.

On June 2, Fish Distribution Car No. 02 will leave Sisson on the first trip of the season. A consignment of 100,000 quinnat salmon fry will be shipped from Mt. Shasta Hatchery on this trip, consigned to H. E. Westbrook of Smith River. Delivery of the fish will be made at Grant's Pass, Oregon. From that point the shipment will be transported overland in auto trucks and planted in Smith River, Del Norte County, near Crescent City. Immediately upon the return of the car from Grant's Pass, the shipment of trout fry from Mt. Shasta Hatchery will be commenced. Car No. 02 has just returned from the Southern Pacific car shops at Sacramento, where it has been fitted up with a new type of gas engine and air compressor. This distribution car, which is a converted Southern Pacific baggage car, operated under lease to this commission for the season of 1918, is exceptionally well equipped for the season's distribution work, many important improvements having been made in the special aerating apparatus.

Distribution Car No. 01 is at the present time in the Southern Pacific shops at Sacramento, where it is being reconstructed. An entire new steel underframe was recently received from the East, and with extensive repairs to the trucks, roof and body of the car, repainting, etc., the car will be as good as new when completed. The engines and aerating apparatus, too, are to be given a thorough overhauling before the car is again put on the road. This work is all being rushed to completion, and it is expected that the car will be ready for operations by the middle or latter part of June. The first work undertaken by Car No. 01 this season will be to assist in the distribution of trout fry from Mt. Shasta Hatchery. Later on in the season it will in all probability be sent south to take up the distribution of fish in the waters of southern California from the Mt. Whitney Hatchery.

TAKE OF EGGS BELOW NORMAL.

Owing to the extreme drought this season the take of both rainbow and steelhead trout eggs was considerably short of our expectations. Every effort was made to obtain a greater number of trout eggs than ever before, but despite out utmost endeavors only between sixteen and seventeen millions of eggs of all species were obtained. On some of the streams where our egg-collecting stations are located the flow of water became so low during the latter part of April that all egg-collecting operations were discontinued before the first of May, whereas, in normal years, operations are carried on until very near the first of June. This condition was especially noticeable at the Snow Mountain Station on the Eel River, Mendocino County, where steelhead trout eggs are taken. The water in the river fell so rapidly and became so low during the closing days of April that it was only by exercising the greatest care and working night and day that the hundreds of thousands of steelhead eggs being "eyed," in preparation for shipment to other stations, were saved. Other stations affected by the extreme drought were: Scott Creek Station in Santa Cruz County, the Klamath stations at Bogus Creek and Camp Creek in Siskiyou County, Almanor and Domingo Springs stations in Plumas County, and Tallac Station, El Dorado County. Had it not been for the preparations made for obtaining a record take of eggs this season, fishcultural operations for the year 1918 would undoubtedly have been a failure. As a result, however, of our extensive operations we will be enabled to distribute in the waters of the state in the neighborhood of sixteen million trout fry, and this number, under the circumstances, will be made to fill all requirements.

BROOKDALE HATCHERY.

The distribution of trout fry from Brookdale Hatchery has been commenced, and by the middle of June the streams of Santa Cruz County will have

been well stocked with fish. Following the Santa Cruz County distribution work, the streams of Santa Clara County will be taken care of by the Brookdale Hatchery. Owing to the fact that there is grave danger of the water supply giving out if operations are continued much beyond the fore part of July, it is essential that the distribution work from Brookdale Hatchery be rushed to completion at an early date.

UKIAH AND FORT SEWARD HATCHERIES.

Ukiah and Fort Seward hatcheries will commence distributing fish in the streams of the north coast counties during the fore part of June. At these stations also it will be necessary that the distribution work be completed before the water supply becomes too low.

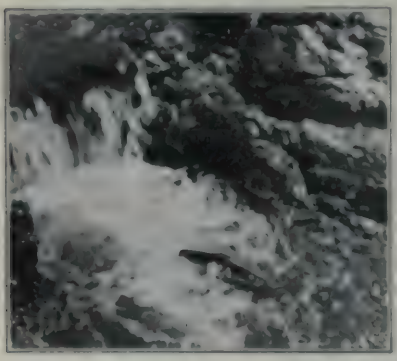

Fig. 77. Trout ascending fish ladder of Snow Mountain Dam, in Mendocino County. The Snow Mountain egg-collecting station is situated near by. Photograph by S. Campbell, April, 1918.

ALMANOR HATCHERY.

Almanor Hatchery distribution operations will be commenced in the near future, and by the fore part of July the planting of fish from Domingo Springs Station will be under way.

FEATHER RIVER HATCHERY.

A new hatchery has been constructed on Gray Eagle Creek near the town of Blairsden, Plumas County, on the line of the Western Pacific Railroad. From this station trout fry will be shipped to supply the applicants of Plumas, Modoc and that portion of Lassen County, along the line of the Nevada, California and Oregon Railway. This station, which will be known as the Feather River Hatchery, is at present only a temporary structure. If conditions prove to be favorable for fishcultural operations, a permanent hatchery will be constructed next season.

BEAR LAKE HATCHERY.

Bear Lake Station is fulfilling all expectations. Even under adverse weather conditions obtaining, this season's results have been most satisfactory. With the improved facilities at North Creek Station we were enabled to obtain in excess of three million rainbow trout eggs. A considerable number of eggs, after being "eyed," were shipped to Mt. Whitney and Mt. Shasta hatcheries, where they will be hatched, reared and distributed in the waters of the state. In excess of one million of the eggs will be hatched and reared at North Creek Station and at the main hatchery near Green Spot Springs, for liberation in the streams of San Bernardino County and Big Bear Lake.

MOUNT WHITNEY HATCHERY.

The results of the extensive improvement work recently commenced at the Mt. Whitney Hatchery are beginning to show. The large pond is nearly finished, and the work on the grounds is progressing nicely. The fish hatched from Eastern brook and Loch Leven eggs shipped to this station during the early spring months are thriving well and are about ready for distribution. The steelhead trout fry hatched from eggs shipped from the Snow Mountain Station are also doing well.

WAWONA HATCHERY.

All repairs to the building, flumes, tank, etc., at Wawona Hatchery have been completed. On May 12, consignments of rainbow and steelhead trout eggs were received at Wawona from Mt. Shasta and Brookdale hatcheries. The resulting fry will be distributed in the streams in and around Wawona, as in former seasons.

TAHOE HATCHERIES.

Egg-collecting operations at Mt. Tallac Hatchery have been nearly up to normal

this season, and the usual number of black-spotted trout fry will be distributed in the streams tributary to Lake Tahoe from the Mt. Tallac and Tahoe City hatcheries. Consignments of black-spotted eggs for distribution in other sections of the state will also be shipped from Mt. Tallac Hatchery to Mt. Shasta and Mt. Whitney hatcheries.

LADDERS AND SCREENS.

Reports have been received to the effect that a fish ladder has been installed over the Huseman Dam, the property of the Lucerne Water Company, near Granada, Siskiyou County. This is one of the dams for which plans and specifications for a fish ladder were furnished during the early spring months. It has also been reported that an open cut, to enable fish to pass the dam, has been constructed in the Spaulding Dam in Little Shasta River, Siskiyou County. This dam is the property of the Spaulding Mill.

Reports from Shasta, Tehama, Modoc and San Bernardino counties indicate that screens are being installed in a great many irrigating power ditches and canals, in accordance with our instructions. Screen surveys were recently made in Lake County, and we have been assured that the screens will be installed as soon as materials can be obtained for their construction. Among the more important automatic cleaning screens recently installed are those of: Bert Hampton, near Mineral, Tehama County; R. W. Haynes, Burney, Shasta County; R. L. Johnston, Montgomery Creek, Shasta County; P. Bertagna, Montgomery Creek, Shasta County; Pacific Improvement Company, Castle Crags, Shasta County; W. L. Williams, Chromite, Shasta County; and Mrs. R. McKay, Red Bluff, Tehama County. The work on the large screens for the Stanford University Vina Ranch in Tehama County is being rushed, and within a very short time these screens should be ready for installation. The largest rotary screen ever constructed in the state was completed about a month ago. It was installed by the Anderson-Cottonwood Irrigation District at the intake of their canal, near Anderson, Shasta County. The screen is in three sections, each 9 feet wide by 12 feet 5 inches in diameter, and is of the southern California Edison type. A recent inspection was made of this screen, and it was found to be working perfectly.

COMMERCIAL FISHERY NOTES.

N. B. SCOFIELD, Editor.

KELP AND POTASH MANUFACTURE.

During the year 1917 the following kelp companies operated in California:

Diamond Match Company
Hercules Powder Company
Lorned Manufacturing Company
Pacific Products Company
Occidental Chemical Company
San Diego Kelp Ash Company
Sea Products Company
Swift & Company Kelp Works

Besides these companies several outfits known as "handpickers" operated along the southern California coast. Their method of operation is to go out in boats and cut the kelp by hand and pull it in over the side of the boat or load it into small barges. The kelp is then taken ashore where it is scattered on the grass to dry. When it is sufficiently dried it is burned in an open kiln. The resulting ash is sacked and sold to the larger companies who refine it to extract the potash and other salts and by-products, or else it is shipped direct to refineries in the eastern United States. It takes twenty tons of wet kelp to make one ton of ash and the ash contains between eight and ten per cent of pure potash.

A few of the larger companies and the United States experimental plant at Summerland have chemists and chemical engineers employed who are endeavoring to devise more economical means of extracting the potash salts as well as developing by-products; the object being to make it profitable to continue the operation of the plants when the price of potash shrinks to near what it was before the war. So far the best results in the way of developing by-products are being obtained in the fermentation process

such as is employed by the Hercules Company at San Diego. One of the most likely leads on which they are working is the development from the celulose of the kelp of a base for the non-inflammable shellac which is used for aeroplanes and non-inflammable motion picture films.

The company feels confident that it will be able to continue the San Diego plant after potash has shrunk to its pre-war price. The companies believe that more economical methods of refining of the potash salts will be developed as they gain in experience and cite as an example the wonderful progress that has been made in the process of sugar refining.

At the beginning of the kelp industry there was much prejudice against the cutting of the kelp beds, for it was believed by many that the beds were the spawning places of many varieties of fish and that if the beds were cut the kelp would be destroyed and thus not only would the fish be destroyed for the want of a spawning place but the beaches would be deprived of the protection the beds afford against the high waves. It has been found that the kelp is not destroyed by cutting and

Fig. 78. New patrol boat "Albacore" under way. Photograph by H. B. Nidever.

that it regrows within ninety days. Even after the most severe cutting, which takes off the tops of the kelp spread out on the surface of the water, enough tops remain intact to still offer a good refuge for fish and to protect the beaches against the action of waves. It has been found through the investigations of the United States Bureau of Fisheries and the Scripps Institution that cutting the kelp does not destroy the fishes spawn. In fact, no spawn of any fish has been found on the kelp which is harvested.

Some complaint has also been made of the odor of the kelp at the factories during the process of incineration. The odor, which is not unlike that of roasting coffee, has been mostly overcome by passing the gases again through the fire and thence through condensing rooms and sprays of water.

FISHERY STATISTICS.

In order that the statistics of the fisheries, which the Fish and Game Commission has been gathering during the past three years, may be more complete and accurate, a new system is being employed. The present law requires that packers and dealers receiving fish from fishermen make monthly reports to the Fish and Game Commission of the amount of each variety of fish received. They are also required to issue receipts to each fisherman from whom fish are received and to keep a carbon copy of the receipt which must be kept at least six months for the inspection of the commission.

It is extremely valuable from a conservation standpoint that accurate records of individual boat catches be kept. It has proved to be of importance also to the Food Administration that individual boat records in certain fisheries be kept. The Fish and Game Commission therefore has undertaken to furnish the Food Administration with this needed information. Each packer and dealer now is furnished receipt books in triplicate to be used when receiving fish. One carbon copy will be for the use of the Fish and Game Commission. From these receipts will be compiled the monthly records of the quantity of each variety of fish taken in the state. The Food Administration will be furnished with data as to prices paid, to whom fishermen under contract are delivering fish, and the average yearly catch of boats in any fishery. By using these books the packers and dealers will be relieved of the trouble of making out the monthly fish report which has been required and also the weekly report of receipts from individual boats now required by the Food Administration in certain of the fisheries. Not only will the dealer and packer be benefited and the Food Administration receive the information it requires, but the Fish and Game Commission will be getting a system of statistics more complete and accurate than

that of Scotland which leads all other countries in statistical fisheries conservation work. The record of individual boat catches such as will be gathered each year will be priceless in determining the trend of the fisheries and will be conclusive evidence whether any fishery is or is not being depleted.

INCREASE WORKING FORCE.

To gather the fisheries statistics necessary for the conservation of the fisheries and to compile the data desired by the Food Administration, the Fish and Game Commission has employed two extra men, one to be located at San Francisco and the other at San Pedro Harbor. To facilitate this work and to keep in better touch with the already extensive and rapidly growing fisheries of Southern California, the Fish and Game Commission has established an office on Fishermen's Wharf, San Pedro, where the statistical files for that part of the state will be kept and tabulated. The office will also be a headquarters where information may be obtained by fishermen or anyone else interested in the fishing or kelp industries. A laboratory is also being fitted up in connection with the office to be used by the commission's fisheries investigators.

CONSERVATION IN OTHER STATES.

BEAVER WANTED IN MICHIGAN.

Even the State of Michigan, which was once noted for its colonies of beavers, realizes the fact that she must re-colonize these animals. Conservationists are urging the stocking of tributary creeks flowing through sand plains, on the plea that these animals would cause no hardship on agriculturalists. The beaver is pointed out as the only fur-bearing animal that does not prey on other forms of wild life.

MINNESOTA HELPS IN GOVERNMENT'S "EAT MORE FISH" CAMPAIGN.

As a part of the campaign of the United States Bureau of Fisheries, designed to get people to eat more fish, the State of Minnesota is conducting demonstrations of the cooking of the coarser fishes, such as the carp, bowfin (dogfish) and buffalofish. Two different parties are now touring the state. Work of this kind has proved of great value in Illinois and other states.

MARYLAND TO HATCH STRIPED BASS.

Maryland is constructing and equipping two fish hatcheries. One of them for the tidewater work is to be a floating hatchery.

This hatchery will be equipped to propagate white perch, yellow perch, shad and herring and it is also proposed to try out the propagation of rockfish or striped bass.

NEW YORK ENFORCES FISH AND GAME LAWS.

The New York Conservation Commission, headed by George D. Pratt, is enforcing the fish and game laws. Of the 243 cases reported for August, 1917, 202 were settled in civil actions, and $4,443.72 was recovered in fines. Even frogs are protected in New York, and the one violation of the law reported was settled in court and a fine of $21.00 was collected. Violations of the law protecting fur-bearing mammals netted $39.00, and the six cases brought into court having to do with the protection of song birds resulted in fines amounting to $185.40.

WASHINGTON GAME FARM.

The Washington Fish and Game Commission is trying out the experiment of placing the game farm at the state penitentiary, and utilizing convict labor. The experiment will be watched with interest.

AUTO HUNTING STOPPED IN NEW JERSEY.

A law making it illegal to kill or pursue birds or animals by the aid or use of an automobile is now in effect in New Jersey. The penalty for violation of the act is $50 for each offense.

Provisions of the anti-automobile hunting law are very specific. They make it unlawful for any person or persons while in an automobile to hunt for, pursue, shoot, shoot at, kill, capture, injure or destroy any bird or animal in this state.

or to use any light or lights carried on or attached to any automobile for any purpose whatsoever in hunting.—Sportsmen's Review Mar. 23, '18.

PENNSYLVANIA WILL PROTECT RUFFED GROUSE.

A petition by which counties can be closed against the shooting of ruffed grouse, is being sent by the Pennsylvania Game Commission to sportsmen and hunting clubs throughout Pennsylvania.

Ruffed grouse, or pheasants, are becoming alarmingly scarce in various sections of the nation and sportsmen in Pennsylvania are insisting that the season for grouse must be closed for a period if this, the greatest of American game birds, is to be preserved from extinction. Unfortunately these birds can not be purchased in either the United States or Canada. Therefore drastic steps must be taken if the grouse are to be saved.

Already about a dozen counties have closed the season for one or two years and the petition is circulated in the hope that all the counties will act simultaneously to protect the bird for two years.

LIFE HISTORY NOTES.

LIONESS TRACKED TO LAIR.

On April 24, 1918, I made a trip up the mountain side northeast of Wawona looking for lion signs and found the tracks of a female mountain lion (*Felis concolor*). The tracks were about two days old. My dogs cold trailed her until it began to rain heavily, which destroyed the scent, so I was compelled to give her up for that day. I was convinced that the lioness had young in some of the bluffs in that vicinity so started early the next morning to hunt the bluffs and about seven o'clock the dogs picked up the trail of the lioness which was then about twelve hours old. After trailing about three hours, during which time the lioness had made several unsuccessful attempts to kill a deer, the trail finally led to the carcass of a doe which was partly devoured as it had been killed several days earlier (see fig. 80). From here the lioness went up the mountain, circling round a bluff of rocks. On the upper side, atop of the bluff, the trail apparently ended for the lioness had jumped down over a ledge and

Fig. 79. Site of the lair of mountain lion near Wawona, California. Photograph by Jay C. Bruce.

worked down the bluff to her lair (see fig 79). After circling for about ten minutes without locating the trail the dogs winded the lair and soon located it. The mother lion was in the lair with the three kittens.

After some difficulty I succeeded in shooting the mother lion in her lair and then captured the three kittens which were about ten days old, I should judge.

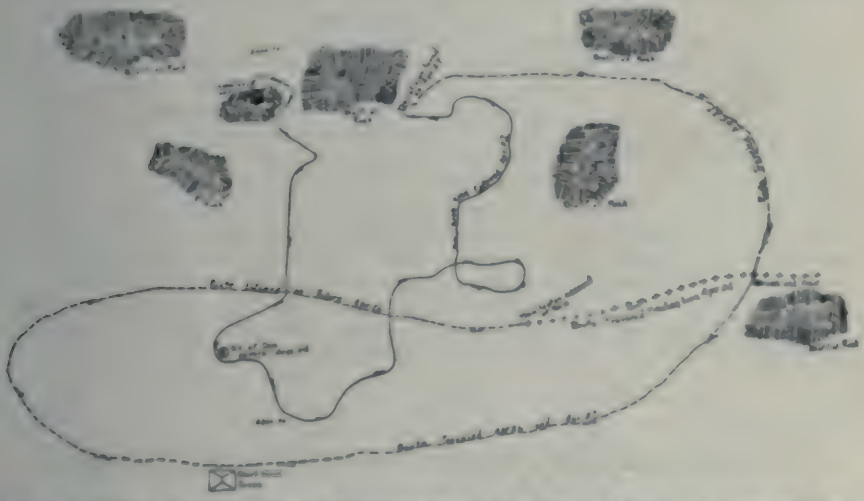

Fig. 80. Diagram showing location mountain lion lair and route followed by hunter and lion.

The lair was about six feet long and two feet wide. The nest was bedded with pine needles, probably carried in the den by wood rats for their nests at some time. There was also a small opening, perhaps eight inches in diameter, through which the sun would shine on the kittens in the nest.—JAY C. BRUCE.

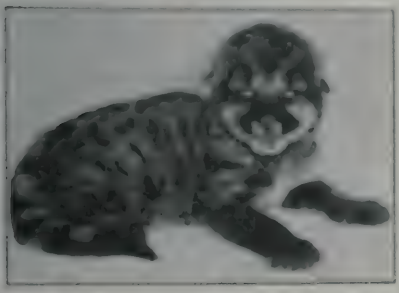

Fig. 81. Mountain lion kitten captured by J. C. Bruce near Wawona, California, on April 27, 1918. Photograph by Jay C. Bruce.

QUAIL SUFFERED FROM LACK OF FOOD.

During the severe snow storm in January, 1916, great numbers of quail died in Modoc County, either from lack of food or lack of shelter. Ranger Snelling placed large quantities of wheat near all the warm springs in Pitt River Canyon where the snow had fallen to a depth of thirty-six feet. The quail, after devouring the food set for them, would seek shelter under roots and brush and even in the holes of small animals, where they very often died during the night. The snow would become so packed that the birds were unable to come out of their resting places and would be smothered. Consequently, it was seen that not only food, but also shelter must be provided for the quail during heavy storms. The numbers of birds dwindled from three hundred and fifty first seen at the feeding places, to nineteen, the number finally captured with traps. The captured birds were fed and kept in a warm place for about a month when they were given their liberty. These quail returned again and again to the old feeding places.—G. W. COURTRIGHT.

AN EMPEROR GOOSE TAKEN IN GLENN COUNTY.

On Sunday, December 2, 1917, I saw in a string of ducks killed by a Los Banos hunter a fulvous tree-duck. I believe

this is a rather late date for this bird to be found in that section.

I was recently advised by Dr. B. A. Mardis of San Francisco, California, that he killed an emperor goose near Norman, Glenn County, California, during the fall of 1916. This bird is now on display in the store rooms of the Ellery Arms Company.—J. S. HUNTER.

VALLEY QUAIL LAYS TWENTY-NINE EGGS.

Those who are endeavoring to rear valley quail in captivity will be interested in the following results obtained in the past breeding season. A valley quail which I have kept in captivity for several years deposited her first egg on March 2 and the last one on May 16, making a total of twenty-nine eggs. She showed no inclination to incubate them so it has been necessary to hatch them under bantam hens. A still larger number of eggs for breeding purposes could doubtless have been obtained had the eggs been removed as they were laid.—GEORGE NEALE.

THE BARN OWL AS A GOPHER CATCHER.

Direct evidence of the value of the barn owl is to be found in an experiment performed on the ranch of Mr. Burris, near Hanford, Kings County, California. A young barn owl was taken from the nest and placed where the parent birds could feed it. On the dates indicated the fresh food in view around the young bird was as follows:

May 14th, 6 gophers and 1 jack rabbit.
May 15th, 5 gophers.
May 16th, 1 gopher and 1 jack rabbit.
May 17th, 2 gophers.
May 18th, 4 gophers.
May 19th, 2 gophers.

Thus, a total of 20 gophers and 2 jack rabbits were killed in six days time by one pair of barn owls. In addition the parents fed themselves and another young owl left in the nest.—E. W. SMALLEY.

UNITED STATES FOREST SERVICE CO-OPERATION.

PEOPLE FAVOR ANGELES GAME REFUGES.

People are in favor of the two refuges of approximately 600,000 acres within the Angeles Forest, known as 4-A and 4-B. Deer are becoming more and more plentiful. We have approximately 400,000 people go into the forest each year for recreational purposes, and if there are 1,000 deer hunters, it stands to reason that the opposition of 399,000 should outweigh that of 1,000. If anyone is benefited by reason of an open season, it would be the resort owners, and yet with the possible exception of one owner, a man who has been 'n court several times for alleged game violations, I have yet to find a resort owner who is not in favor of the continuance of the game refuges.—B. W. CHARLETON.

ELK INCREASING IN SHASTA NATIONAL FOREST.

The elk in the Squaw Creek District are increasing. Seven cow elks with calves were seen this year (1917). Some of the original herd died off but they seem to be increasing now and are apparently acclimated. All elk seen were in good condition and apparently doing well.—WM. GRACEY.

GAME SCARCE IN EL DORADO NATIONAL FOREST.

Game is becoming so scarce in the El Dorado National Forest that the consensus of opinion of forest officers is that closed seasons should be enforced as follows:

Deer	3 years.
Grouse	3 years.
Gray Squirrels	3 years.
Quail	3 years.

—E. L. SCOTT.

GROUSE IN THE PLUMAS NATIONAL FOREST.

Grouse are noted in most parts of the Plumas National Forest, but the number is small. Sage-hen are only seen in Frenchman Creek, and a few in Sierra Valley. It is my opinion that the season on both these game birds should be closed for a number of years, and this same opinion has been voiced by a num-

ber of residents of this locality.—A. G. Barrett.

DESTRUCTION OF GAME BY PREDATORY ANIMALS.

Mountain lions are getting very numerous in District 2 21, the southern edge of which borders on the Yosemite National Park, which forms an ideal breeding ground for them, since no hunting or trapping is allowed, and dogs are prohibited as well. Ranger Elliott states that he had noted several instances where deer have been killed by these animals. Gordon McGrue, a trapper who winters in the high country, reports finding the carcasses of five deer which were killed by one lion. He has attempted to trap or poison the lion, but so far has been unsuccessful. Ranger Fowler also reports that he found four carcasses of deer killed by lions. The cases mentioned, which were reported by only three men, would show that lions are about the most serious problem to contend with when the whole forest is considered. We know that four were killed in District 3 and four in District 2 within the last year, although it is quite probable that several more were caught during this time.—Ernestt Bach.

BEARS NUMEROUS IN SHASTA NATIONAL FOREST.

About thirty-five bears were killed in the country between the McCloud River and Kosh Creek in the Shasta National Forest during 1916. Thirty coyotes and ten lions are also reported as being killed in this section during December of the same year.—W. M. Gracey.

THE FISHER IN THE TRINITY NATIONAL FOREST.

Fisher usually inhabit the higher, heavily timbered slopes and are seldom found at lower elevations except during the winter months when the country is covered with snow. It is thought that their food consists chiefly of field mice, gophers, tree squirrels and other small bird and animal life. On New River a settler is attempting to raise fisher in captivity, but so far has had only indifferent success. It is estimated that twenty to twenty-five fisher are taken each year on the Trinity National Forest, although the species is becoming more rare.—F. V. Jotter.

WILD LIFE IN RELATION TO AGRICULTURE.

MOUNTAIN RATS INJURE YOUNG TREES.

Forest Examiner Munns of the United States Forest Service has made an interesting study of the damage done by pack rats to young pine growth on the Angeles Forest. In one locality where the rats were numerous it was discovered that 43 per cent of the young trees have been severely injured or killed by these animals. The rats seem to work chiefly during the late summer and fall and usually more in a dry season than in a wet one. Mr. Munns concludes from this that the rats, which often have no access to water, tear off the tender bark in search of moisture. —*Weekly Bulletin of Forest Service*, Dec. 23, 1916.

IT PAYS TO DESTROY GROUND SQUIRRELS.

A word in regard to the economy of the ground squirrel eradication is at the present peculiarly appropriate, at a time when such stress is being laid on the conservation of the country's agricultural resources. During the past year it was estimated that squirrels on Union Island, in San Joaquin County, caused a damage to crops amounting to $65,000. An expenditure of $10,000 would practically completely free this land of squirrels and $1,000 a year thereafter would insure continued freedom. Surely it is more important to eradicate such a damaging pest from land now under cultivation than to cultivate even very large tracts of now uncultivated lands.—*Cal. State Bd. of Health Month. Bull. 12*, p. 321.

CALIFORNIA FISHERY PRODUCTS—JANUARY, FEBRUARY, MARCH, 1918.

Species of fish	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Tehama, Glenn, Colusa, Butte	Solano, Yolo	Sacramento, San Joaquin	Alameda, Contra Costa	San Francisco	Santa Cruz	Monterey	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego	Imperial	Totals	Market
Albacore												61,378				61,378	1,927
Anchovy										91,286						91,286	
Barracuda								4,912	15,284			71,411		451,092		543,699	136,840
Bonito												7,710		18,286		25,996	4,004
Rockfish								15,363	72,701	271,601						459,665	
Bluefish								5,693	330	7,256						13,279	
Chilipepper								49,357	56,587	5,506						111,450	
Carp		14,834	8,250	2,988	8,687	11,918	35,158	3,402				32,539				139,472	
Catfish		73,168		2,383	1,966	15,573	11,393	912								105,396	
Codfish								70,657		7,985	150	2,149	161			81,652	
Cultus cod	82							134,417	8,543	132,736						275,778	
Dogfish								167,191		5,075		9,611		1,495		185,372	
Flounder	10,129		99		981		51	198,391		69		4,999		1,120		215,670	
Halibut	60							20,389	653	889	56,530	486,149	2,304	559,725		1,087,685	156,970
Hake								12,422	3,575	8		1,593		2,359		19,897	1,113
Hardhead				7,195		7,205										14,400	
Herring	4,078		3,005,320					4,591,268	5,980							7,605,256	
Kingfish			10					5,400	19,769	14,857		278,666		9,714		327,796	
Mackerel										165,221		568,187	1,091	62,768		797,117	13,343
Mullet															64,467	64,467	
Pike			1,295	433	294	717	4,573	172								7,384	
Pompano								228		246		7,282				7,756	
Perch	8,975	258	38,897				15	5,315	2,356	3,844		2,595	15			62,180	
Rock bass												55,290		6,798		62,122	
Rockfish	2,852							372,895	185,417	335,618	69,638	837,388	15,224	562,414		2,381,626	855
Sole			36					1,291,294	283,395	94,674	9,955	45,289	138	2,403		1,726,185	
Salmon		1,273	2,253	6,750	75,334	29,191	80,264	6,618	337	329,499						529,179	
Smelt	744		3,766					33,786	3,141	3,703	2,675	34,439	2,750	21,743		106,815	
Sea bass (white)										126	40	18,504		5,670		24,340	
Sea bass (black)												7,789		11,445		19,177	1,516
Sand dab								427,646	36,982	1,717		6,293				472,638	
Striped bass			19,955	746	132,228	47,512	256,788	11,846	31							469,104	
Shad			1,639		14,537	1,488	30,767	505								48,576	

Splittail				5,652		2,827	1,115									7,644	
Sucker						4,595										4,595	
Sardine		240	491							2,594,110		39,474,762		1,677,219		41,439,822	
Skate								101,159		729		3,464	28			105,380	
Sculpin								105				7,479				7,844	
Tom cod								4,592				510				5,102	
Trout (lake)								295	1,151					47		1,493	
Trout (steelhead)			491													491	
Turbot			200				10				525	40				825	
Whitefish			4,569													4,569	
Yellowtail									43,934	22,491		48,874		116,250		231,345	40,404
Miscellaneous			102	2,351		1,315		7,982	230	1,907		6,769		5,812		27,368	160
Totals	20,625	89,773	3,667,314	26,708	283,337	122,171	420,249	7,540,034	739,846	10,882,277	185,513	33,625,300	21,724	3,482,500	64,467	59,896,138	326,326
Crustaceans—																	
Crab (dungeness)	1,862							36,940	454	95						39,391	
Spiny lobster											14,673	29,826	1,529	55,113		85,349	188,265
Shrimp								58,012								58,012	
Mollusks—																	
Squid										16,083		20,677		13,912		50,672	
Cuttlefish								6,182	3,846	4,292		53				14,373	
Clam (Pismo)											175,694					175,694	
Clam (rock)			2,304								60	8,852				11,216	
Clam (softshell)		3,158	52,870				25,786									81,814	
Clam (other)	9,225	540	23,944					200	252			7,092				41,253	
Oyster (eastern) No.			14,250					746,650								760,870	
Abalones										71,988	12,452					84,440	
Mussels	560		189					1,758	4,270	100	6,431	12,183		480		25,961	
Snails												661				661	
Reptiles—																	
Terrapin			811													811	
Sea turtle														895		895	10,042

VIOLATIONS OF FISH AND GAME LAWS.

February 1 to June 1, 1918.

Offense	Number of arrests	Fines imposed
Game.		
Hunting without license	12	$195 00
Trapping without license	2	15 00
Spike buck, killing	1	
Deer meat, close season, possession	7	100 00
Trailing deer, close season	3	50 00
Illegal deer hides, possession	2	
Ducks, close season, killing or possession	4	75 00
Quail, close season, killing or possession, sale	4	107 50
Geese, close season, killing or possession	6	125 00
Cottontail rabbits, close season, killing or possession	4	75 00
Wild pigeon, close season, killing or possession	1	25 00
Wild pheasant, killing	1	50 00
Tree squirrels, close season, killing or possession	3	
Nongame birds, killing or possession	4	45 00
Total game violations	54	$869 00
Fish.		
Angling without license	27	$477 50
Fishing for profit without license	7	85 00
Making false statement on application for license	2	50 00
Trout, close season, taking or possession	18	375 00
Trout, excess bag limit	8	200 00
Trout, taking other than by hook and line	13	300 00
Trout, shipping by parcel post	1	
Striped bass, undersize, taking or possession	3	50 00
Black bass, close season, taking or possession	1	
Catfish, undersize, offering for sale	3	60 00
Sturgeon, possession, offering for sale	1	
Young of fish in possession	3	20 00
Salt water eels, undersize, taking or possession	3	100 00
Abalones, close season, undersize, taking or possession	17	380 00
Crabs, female, undersize, shipping from Humboldt Bay	8	120 00
Clams, undersize, excess bag limit	8	170 00
Illegal fishing apparatus	13	645 00
Dynamiting fish	2	400 00
Total fish violations	138	$3,412 50
Grand total fish and game violations	192	$4,302 50

SEIZURES—FISH, GAME AND ILLEGALLY USED FISHING APPARATUS.

February 1 to June 1, 1918.

Game.

Ducks	137	
Geese	8	
Quail	1	
Cottontail rabbits	5	
Tree squirrels	6	
Deer meat	178	pounds
Deer hides	24	
Deer feet	52	
Spike buck head	1	
Tree squirrel skins	41	

Fish.

Trout	439	pounds
Striped bass	513	pounds
Black bass	6	pounds
Salmon	69	pounds
Sturgeon	123	pounds
Catfish	124½	pounds
Salt water eels	62	
Abalones	315	
Crabs	330	
Crabs (cooked)	30	
Clams	1,537	
Lobsters	25	
Cockle clams	606½	pounds
Nets, traps and fishing outfits	5	

Searches.

Illegal fish and game	80

STATEMENT OF EXPENDITURES—YEAR 1918.

Item of expense	January	February	March	April
General administration	$1,950 09	$1,897 21	$1,782 56	$1,699 30
Research, publicity and education (game)	233 61	287 30	298 95	339 25
Printing	730 22	306 42	37 92	662 00
Fish exhibits	62 63			
Game exhibits				
Game farm	173 80	305 35	251 70	214 54
Mountain lion bounties	600 00	200 00	800 00	600 00
Lithographing hunting licenses				
Lithographing angling licenses				
Hunting license commissions	1,816 00	963 40	1,150 20	776 30
Angling license commissions	1,055 20	228 60	644 20	349 70
Market fishing license commissions	16 50	8 00	155 00	151 50
Paper Mill Creek Dam				
Totals	$6,766 16	$4,345 28	$5,140 13	$5,084 82
San Francisco district	$5,220 61	$5,520 48	$5,081 34	$5,624 48
Sacramento district	3,505 89	3,454 18	5,456 16	5,748 06
Los Angeles district	2,481 66	2,297 14	2,088 67	2,619 80
Launch patrol	642 27	1,109 92	1,486 10	1,217 53
Prosecutions (fish and game)	374 75	43 95	146 70	197 45
Crawfish inspection				
Winter game feeding				
Accident and death claims	250 80	539 29	212 50	124 04
Totals	$12,555 98	$12,724 86	$12,676 47	$13,486 36
Hatchery administration	$796 33	$816 90	$884 08	$668 97
Mount Shasta Hatchery	2,117 19	1,940 11	1,286 75	1,293 13
Klamath Station	297 25	426 30	316 10	514 75
Mount Whitney Hatchery	632 97	632 97	1,151 49	2,350 20
Rae Lakes Station				
Cottonwood Lakes Station				
Tahoe Hatchery	2,095 00	12 10	13 90	5 00
Tallac Hatchery	5 00	5 00	265 46	371 22
Fort Seward Hatchery	291 55	297 54	253 78	404 51
Ukiah Hatchery	23 63	20 78		100 42
Snow Mountain Station	368 79	382 96	355 16	297 62
Brookdale Hatchery	174 73	288 20	141 70	224 91
Scott Creek Station	31 00	28 00	78 10	101 00
Almanor Station	5 00	7 30	50 75	255 70
Domingo Springs Station	13 50		205 00	116 68
Bear Lake Hatchery	1 11	24 38	342 74	445 71
Wawona Hatchery				
Fish distribution	26 15	9 25	229 29	316 45
Fish transplantation	41 10			18 00
Screen, fishway and water pollution	599 70	635 98	714 72	664 09
Special field investigations				
Totals	$7,390 00	$5,516 72	$6,270 02	$8,492 76
Feather River Hatchery				$376 06
Fishery research and patrol	$1,335 29	$1,282 83	$1,383 92	1,517 64
Grand totals	$28,087 43	$23,869 49	$25,429 54	$28,517 64
Department of Engineering, launch "Albacore"	2,872 30			

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CALIFORNIA FISH AND GAME

"CONSERVATION OF WILD LIFE THROUGH EDUCATION"

Volume 4 SACRAMENTO, OCTOBER, 1918 Number 4

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THE FLAT-FISHES OF CALIFORNIA.*

By EDWIN C. STARKS, Stanford University.

Though most of the flat-fishes on the California coast are known as soles, they are in truth all flounders but one—a very small one that is seldom taken and never used for food. The name sole seems to insure a better market than the name flounder, with the result that more and more of the flat-fishes that were once correctly called flounders are now called soles, and the name flounder is seldom used. The name flounder is used herein except in a few places where the name sole has been used so long it is firmly fixed.

The flat-fishes form a well marked group strikingly separated from all other fishes by one side of the head and body being white or almost colorless, while the other side is dark, and with the eyes both on the dark side. They lie on the sea bottom flat on the colorless side with the eyes and color on the uppermost side.

*A report of the Committee on Zoological Investigations of the California State Council of Defense.

When the flat fish is born, however, and for some time afterwards, it is symmetrical and has an eye on each side of the head, while it swims back upwards as does any other fish. As it grows it leans more and more to one side, and the eye on the side toward which it leans gradually creeps over to the other side of the head. Though the eye only seems to creep to the other side, the whole skull in truth twists, and the part that is between the eyes is the part that is normally on top of the head in other fishes.

A peculiarity of the flounders of the western coast of North America is that several of them have an accessory branch of the lateral line that runs back from the head following under the base of the dorsal fin. There is a species in Japan with this characteristic, but otherwise it is found on flounders from no other part of the world.

The flat-fishes are widely distributed, and are found in nearly all seas. Some of them ascend rivers to where the water is scarcely or not at all salt. Some species, or groups of related species, have the eyes and color always on the right side, while other species have them on the left. A very few species have about an equal number of individuals colored on either side. On our coast are several with this uncertain distribution of color to either the right or left side.

A zoological key has been prepared for the easy identification of the flounders. For those who are unable to use the key there remains the method of hunting through the descriptions and pictures until one is found to fit the specimen at hand. It is urged, however, that the reader become accustomed to the use of the key. Keys are used in nearly all serious zoological books, and will be used in these papers where, as in the flounders, it is difficult to avoid their use. The key is arranged to consider alternative characters; one character being under a single figure (6) as contrasted with an alternative character under a double one (6-6). In long keys a second alternative is often used (6-6-6). If, in consulting the key, the characters under the first figure do not fit the specimen go to those under the double figure. If they do fit read on down, using only the characters that fit (and when they do not fit skipping to where they do) and going as far as possible when the name will be found. For instance: suppose we have a flounder with the ventral fins one on each side of the abdomen; without an arch at the front of the lateral line; the body covered with ordinary scales; the maxillary not reaching to below the hind border of the lower eye; and the pectoral fin longer than the head. We compare our specimen with 1 at the beginning of the key. The ventral fins are not as described, so we skip everything between and consult 1-1, which fits. Taking the next number below, 3, "lateral line with a high arch." It has not. We go to 3-3, which fits. The character under the next number, 8, does not fit, but under 8-8 it does. The next character below, 9, does not fit, for the maxillary does not reach to directly below the hind border of the lower eye, which character is as under 9-9. The next character, 10, fits, for the pectoral is longer than the head, and as we can go no farther it follows that our specimen is the rex sole.

The species in the body of this paper are arranged with reference to their possible relationship, but in the key their arrangement depends only upon convenience.

GLOSSARY.

Anal fin: The fin along the lower edge of the body.

Caudal fin: The tail fin.

Depth of body: The greatest distance from the base of the dorsal to the base of the anal fin.

Dorsal fin: the fin along the back.

Head: The head is measured from the tip of the snout to the edge of the gill cover.

Lateral line: A line of pore-bearing scales along the middle of the body. When the lateral line is said to have an arch in front, it means a high, abrupt arch, not simply the front of the lateral line curved up.

Maxillary: The flattened bone just above the mouth.

Pectoral fins (or pectorals): The fins just behind the gill openings; one on each side of the body.

Snout: That part of the head in front of the eyes.

Ventral fins (or ventrals): the pair of fins on the lower edge of the abdomen.

Families of Flat-Fishes.

The bone of the gill cover that bounds the cheek behind (preoperculum) has the margin distinct, and not covered and bound down by skin and scales. The eyes are rather large, and the mouth moderate or large, and armed with teeth. The Flounders (family *Pleuronectidæ*), page 165.

The bone of the gill cover that bounds the cheek behind has the margin bound down and covered by skin and scales. The mouth is small and much twisted, and the teeth are rudimentary or absent. The only California member of this family differs from the flounders in having the body tapering to a point behind, and the dorsal, anal, and caudal fins continuous around it. The Soles (family *Soleidæ*), page 179.

KEY TO THE FLOUNDERS OF CALIFORNIA.

1. Ventral fins not symmetrical, that of eyed side on ridge of abdomen.
   2. Ridge between eyes concave; highest above lower eye where it rises to a ridge. Lower eye much longer than snout. Soft Flounder (*Citharichthys sordidus*). **Page 178.**
   2 2. Ridge between eyes narrow and not concave; not highest above lower eye. Lower eye about equal to length of snout. Speckled Flounder (*Citharichthys stigmæus*). Page 178.
1–1. Ventral fins symmetrical. One on each side of ridge of abdomen.
   3. Lateral line with a high arch in front. (Not simply curved upwards.)
      4. Pectoral on eyed side as long or longer than the head; reaching about to middle of body. Long-finned Flounder (*Xystreurys liolepis*). **Page 169.**
      4–4. Pectoral on eyed side not much over half as long as head.
         5. Maxillary reaching to directly below hind border of lower eye, or past it.
            6. Eyes very large and separated by a high ridge of bone. Teeth very fine. Big-mouthed Flounder (*Hippoglossina stomata*). **Page 168.**
            6 6. Eyes small and separated by a flat area. Teeth sharp. Chicken Halibut (*Paralichthys californicus*).

To the description when the maxillary is said to reach to below a certain point of mouth cavity is below. Eye diameter: supposing reaching to below middle of eye means that the fish must be held horizontally and the maxillary must reach to or past a line drawn vertically downward from the middle of the eye.

5-5. Maxillary not reaching past middle of lower eye.

7. Depth of body about a third of the length without caudal fin. Scales fine and smooth. Halibut (*Hippoglossus hippoglossus*). Page 166.

7-7. Depth of body about a half of the length without caudal fin. Scales rather large and rough. Double-lined Flounder (*Liopsetta bilineata*). Page 175.

3-3. Lateral line without a high, abrupt arch in front, but usually with a small curve.

8. Body covered with rough, scattered plates. The dorsal and anal with alternate black and orange marks. Starry Flounder (*Platichthys stellatus.*) Page 175.

8-8. Body covered with ordinary scales.

9. Maxillary reaching to vertically behind the lower eye. Arrow-toothed Halibut (*Atheresthes stomias*). Page 165.

9-9. Maxillary not reaching to vertically below the hind border of lower eye.

10. Pectoral fin on eyed side much longer than head. Rex Sole (*Glyptocephalus zachirus*). Page 177.

10-10. Pectoral fin not as long as head.

11. Maxillary reaching to vertically below the middle of the lower eye.

12. First dorsal rays at least twice as long as the eye and for most of their length not connected to each other by membrane. Spotted Flounder (*Pactichthys melanostictus*). Page 168.

12-12. First dorsal rays not as long as eye.

13. Scales small; over 90 rows of them between lateral line and back at widest place. Jordan's Flounder (*Liopsetta jordani*). Page 167.

13-13. Scales larger; not 20 rows of them between lateral line and back at widest place. Slender Flounder (*Lyopsetta exilis*). Page 166.

11-11. Maxillary not reaching to vertically below middle of lower eye.

14. Eyes not separated by high bony and spiny ridge. Dorsal beginning on ridge of body, or only slightly on the blind side.

15. Depth of body about half of the entire length (including the caudal fin). The scales semi-imbedded and scarcely touching each other. Diamond Flounder (*Hyspsetta guttulata*). Page 173.

15-15. Depth of body less than half the entire length. Scales normal.

16. Teeth on both sides of lower jaw. Scales large and rough to the touch when finger is passed towards head. Scaly-finned Flounder (*Isopsetta isolepsis*). Page 174.

16-16. Small blunt teeth on blind side of lower jaw only. Scales small and smooth.

17. Ventral fins longer than long diameter of eye. The lower eye its own length from tip of snout. California Sole (*Parophrys vetulus*). Page 174.

17-17. Ventral fins not over a half as long as the long diameter of the eye. The lower eye one half its length from tip of snout. Slippery Sole (*Microstomus pacificus*). Page 177.

14-14. Eyes separated by a high bony ridge on which are from 1 to 3 short spines. The dorsal fin commencing on blind side of body where it curves downward with from 5 to 9 rays on the blind side.

18. Front of dorsal at level with corner of mouth on blind side of head; at least 9 of its rays on blind side. Curl-finned Flounder (*Pleuronichthys decurrens*). Page 170.

18 18. Front of dorsal above level of corner of mouth; not more than 5 or 6 of its rays on blind side of head.

19. Ridge between eyes high and very sharp edged; ending behind in a sharp spine that stands at least one diameter of the pupil above the surrounding level of the head. Two spines on the front of the ridge, the first one extending forward to vertically above the point of the snout. Sharp-ridged Flounder (*Pleuronichthys verticalis*). Page 171.

19 19. Ridge between eyes not so high and sharp as described above; the front spine, if developed, behind tip of snout.

20. The bony spines at front of ridge that separate eyes scarcely developed. Mottled Flounder (*Pleuronichthys coenosus*). Page 171.

20 20. Two short, blunt spines developed at front of ridge that separate eyes. A dark spot usually present on the lateral line at the middle of the body, and one at each edge of the body near the base of the anal and dorsal fins towards the tail. Ritter's Flounder (*Pleuronichthys ritteri*). Page 172.

FAMILY PLEURONECTIDÆ.

The Arrow-Toothed Halibut (Atheresthes stomias).

This is a rather slender flounder with large scales and a big mouth armed with long sharp teeth, which are shaped like a spearhead at the point. The lateral line is without an arch in front. The space between the eyes is flat and covered with scales. The upper eye is near the edge of the head so that it shows slightly when the fish is viewed from the blind side. The maxillary is about half as long as the head, and reaches to below the hind border of the eye, or a little past.

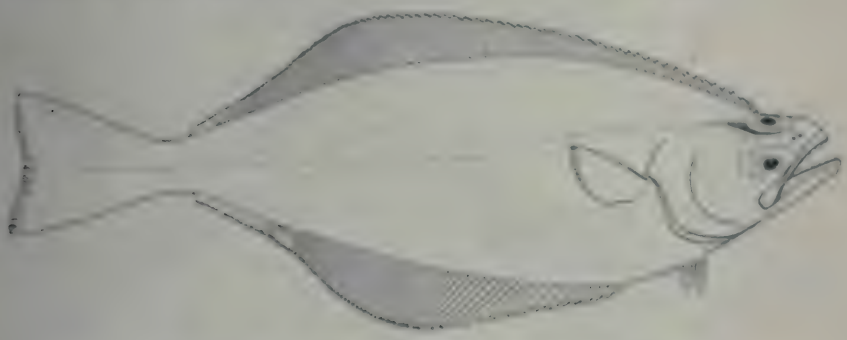

Fig. 82. The Arrow-Toothed Halibut (*Atheresthes stomias*).

This flounder reaches a length of a couple of feet, and is found in deep water off San Francisco and northward to Bering Sea. It is caught in some abundance off San Francisco in the paranzella nets and is a food fish of considerable importance, though not of the best.

The Halibut (Hippoglossus hippoglossus).

The halibut is a slender form with a rather thick body and a moderately large mouth. The maxillary reaches to below the middle of the lower eye. The lateral line has a high arch in front and the scales are small. The eyes are separated by a flat area.

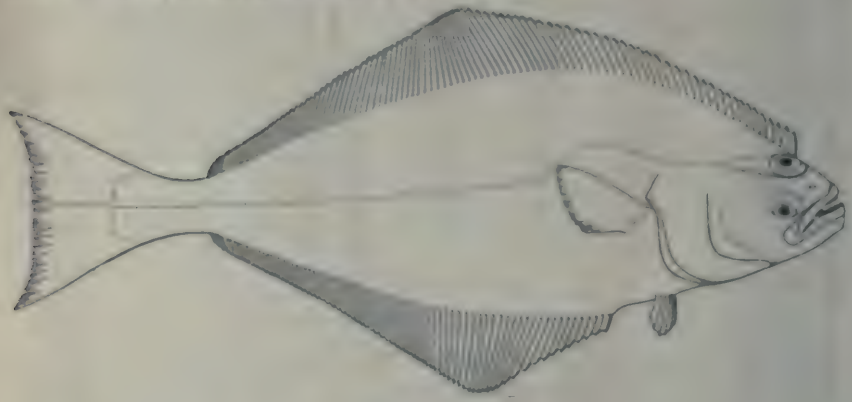

Fig. 83. The Halibut (*Hippoglossus hippoglossus*).

Both in America and Europe the halibut is the largest and most important commercially of all the flounder tribe. It reaches a weight of 500 pounds and occasionally even more. It is found on both sides of the north Atlantic and north Pacific. On our coast it is found southward to Monterey Bay. Its food appears to be anything that it may catch, including many kinds of fishes, crabs and clams.

The Slender Flounder (Lyopsetta exilis).

Body moderately slender, covered with rather rough, large scales. The lateral line is without an arch in front. The eyes are large and

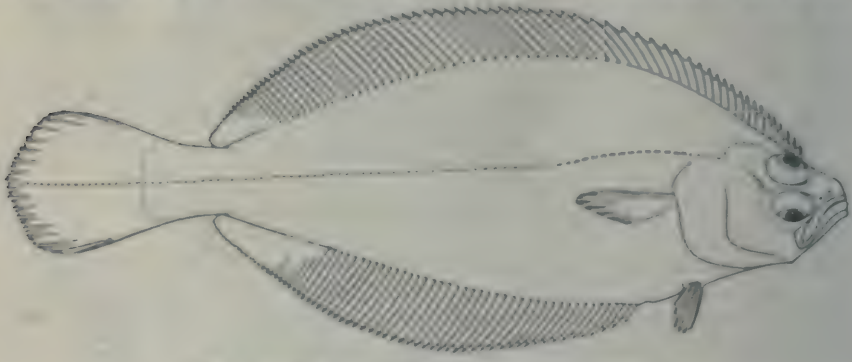

Fig. 84. The Slender Flounder (*Lyopsetta exilis*).

separated by a rather high area that is covered with fine scales. The mouth is large and curved, and the maxillary reaches to below the middle of the lower eye.

This is a small, unimportant, but abundant flounder, scarcely exceeding a foot in length. It is found from San Diego along the entire California coast and northward. The paranzella net fishermen catch it in abundance off San Francisco.

Jordans Flounder (Eopsetta jordani).

This flounder usually goes by the name of English sole, a name that is doubly unfortunate, for it is not a sole at all, and certainly in no way resembles the English sole. It is a moderately broad flounder with a rather large curved mouth armed with fine sharp teeth. The eyes are large, and are separated by a narrow low ridge covered with very fine scales. The maxillary reaches to below the middle of the lower eye. The length of the pectoral fin is about half that of the

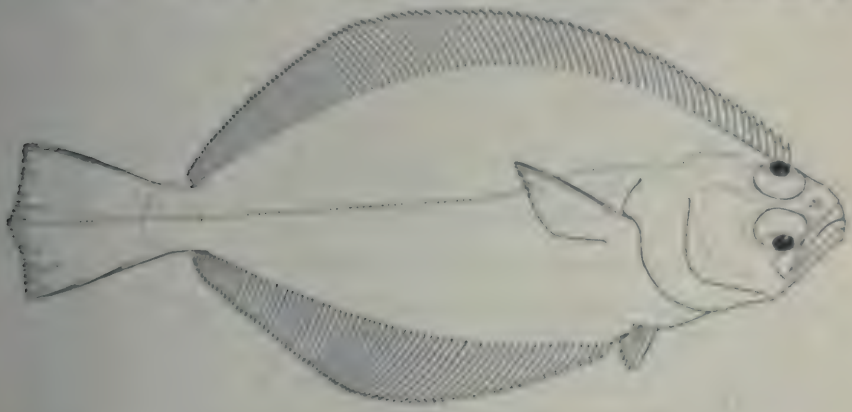

Fig. 85. Jordan's Flounder (*Eopsetta jordani*).

head. The scales are fine and rough to the touch when the finger is moved towards the head. The lateral line is without an arch at its front.

This is one of the commonest flounders on the coast of California. It is found from Monterey Bay northward to Puget Sound, and has been rarely taken as far south as San Diego. It reaches a length of 20 inches, and is one of the best food fishes among the flounders. Great numbers are dried by the Chinese.

The Spotted Flounder (Psettichthys melanostictus).

A rather slender flounder covered with fine scales that feel rough to the touch as the finger is moved toward the head. Fine scales cover the head and bases of the fins. The eyes are small and are separated by a rather wide, scaled area. The mouth is large and armed with long, sharp, uneven teeth. The dorsal fin begins opposite the front edge of the upper eye, and the first rays are long and slender, and connected with each other by membrane only at their base. The longest of the first rays is in length about equal to the distance from the tip of the snout to the hind margin of the upper eye. This character separates

this from any other flounder in our region. The lateral line is without an arch in front. This flounder is grayish-brown finely speckled with darker color.

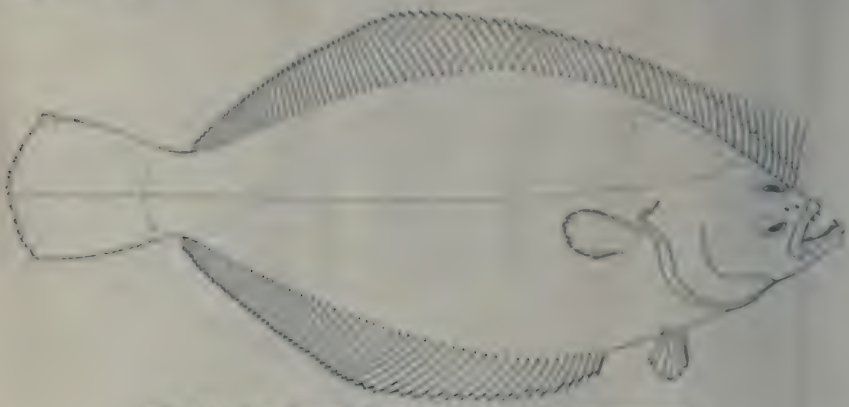

Fig. 86. The Spotted Flounder (*Paralichthys maleo-ocularis*).

The spotted flounder is one of the common flounders, and like many others goes by the name of sole. It lives near shore and reaches a length of 20 inches. It is known from Monterey Bay northward to Alaska.

The Big-Mouth Flounder (Hippoglossina stomata).

A rather slender flounder with a large mouth, very small teeth, and the eyes separated by a high, sharp, bony ridge that curves upwards behind them. The front of the lateral line has an abrupt arch. The first of the two nostrils has a flap of skin just in front of which is a bony protuberance on the side of the snout. The maxillary reaches to below the hind border of the lower eye. The eyes are large and the

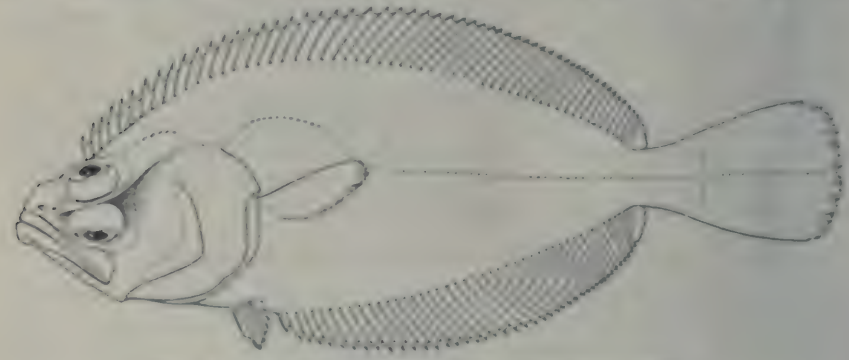

Fig. 87. The Big-Mouth Flounder (*Hippoglossina stomata*).

upper one does not nearly fill its bony socket. The dorsal begins a distance from the tip of the snout equal to the length of the pectoral of the blind side.

This is not a flounder of commercial importance, as it is rather rare. It is found off southern California and southward to the Gulf of California.

The Long-Finned Flounder (Xystreurys liolepis).

This is a wide flounder with an abrupt arch at the front of the lateral line, and a long pectoral fin that is as long, or longer, than the head and reaches about to the middle of the body. The mouth is moderate in size, and the maxillary reaches to below the middle of the

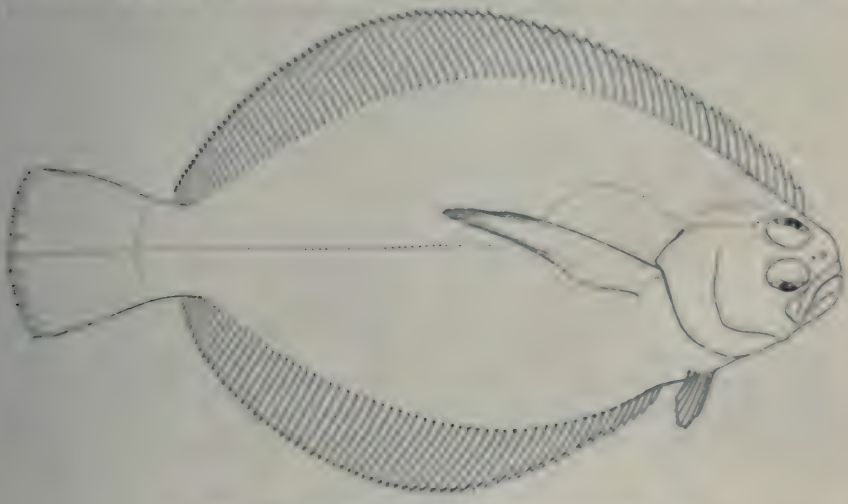

Fig. 88. The Long-Finned Flounder (*Xystreurys liolepis*).

lower eye. This flounder has the longest pectoral of any that has an arch at the front of the lateral line, though the length of the pectoral is said to vary considerably.

The long-finned flounder reaches a length of 15 inches, and is rather common on the southern California coast. It has been taken as far south as the Gulf of California.

The Chicken Halibut or Bastard Halibut (Paralichthys californicus).

Though this flounder is commonly known as the chicken halibut that name is more commonly used for the young of the true halibut. It is a rather slender, thick flounder, resembling somewhat the true halibut in

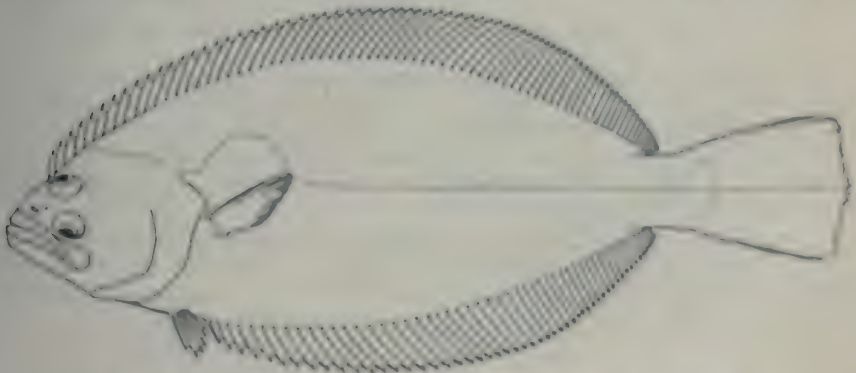

Fig. 89. The Chicken or Bastard Halibut (*Paralichthys californicus*).

shape. The front of the lateral line is arched. The eyes are small and separated by a rather wide flat area. The mouth is large and armed with large, sharp, uneven teeth. The maxillary reaches a little past the lower eye, and is about as long as the pectoral fin. The dorsal fin begins opposite the front of the eye.

This is an important food fish, being found in abundance from San Francisco southward to the Gulf of California. The young are very common in shallow water in southern bays. It reaches a length of three feet and a weight of 60 pounds. It takes its common name from its resemblance to the true halibut, and in southern California usually goes by the name of halibut. It is a rather coarse, flavorless fish, overrated and not to be compared with the true halibut. It has found great favor with the market men on account of its good keeping qualities, and, because it has been much advertised, it is in great demand.

The Curl-Finned Flounder (Pleuronichthys decurrens).

This flounder may be known by the dorsal fin curling down on the blind side of the head until it is opposite the lower corner of the mouth. At least 9 of the dorsal rays are on the blind side. Three other flounders in our region have the dorsal developed on the blind side, but in them it does not extend below the level of the tip of the snout, and only about 5 rays extend down. The sharp ridge between

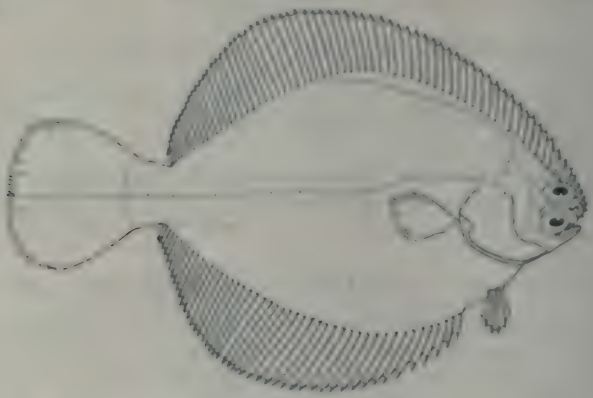

Fig. 98. The Curl-Finned Flounder (*Pleuronichthys decurrens*).

the eyes has a blunt bony protuberance opposite the hind edge of the lower eye, and another smaller one opposite the front of the upper eye. Behind the border of the upper eye there are two similar ones. The eyes are large and protruding. The scales are small, scarcely touching each other, and somewhat imbedded. There is a branch of the lateral line along the dorsal base.

This species is not uncommon in deep water, and is known from the Santa Barbara Islands northward. Many are taken in the paranzella nets. It is not recognized in the markets under a separate name but is sold with many others under the class name of flat-fish or sole.

The Sharp-Ridged Flounder (Pleuronichthys verticalis).

Five or six rays of the dorsal are on the blind side of the body, and the eyes are separated by a very high, sharp bony ridge that has two short sharp spines at its front, the first directly above the tip of the upper jaw and the other at the front of the eye. On the hind end of the ridge is a sharp spine, pointing backward, that stands above the surrounding level of the head a distance equal to the diameter of the pupil. There are no teeth on the eyed side of the jaws. The ventral fin of the eyed side is somewhat behind that of the blind side. The lateral line has an upper branch running back from the head along the base of the dorsal fin. The color is dark olive brown with round grayish spots. The dorsal and anal are mottled.

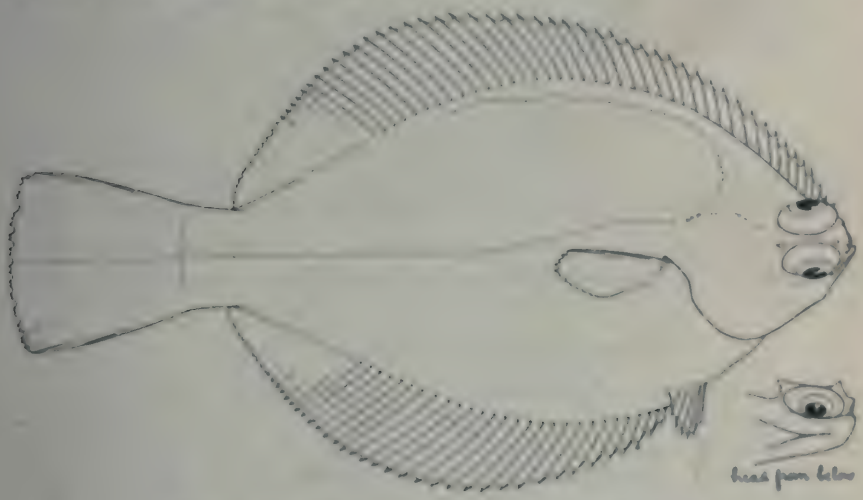

Fig. 71. The Sharp-Ridged Flounder (*Pleuronichthys verticalis*).

This species is known along the California coast southward to the Gulf of California. It is found in rather deep water. Like most of the flounders that are not caught in great abundance this is not differentiated by name by the fish men. It may be known from others that have the dorsal developed on the blind side by the character of the ridge between the eyes and the spines on it as described above.

The Mottled Flounder (Pleuronichthys coenosus).

Five or six rays of the dorsal fin are on the blind side of the body, and the high, sharp bony ridge that separates the eyes has no bony protuberance developed opposite the front of the eyes, but has one opposite the hind edge of the eyes that points backward and downward. There is a branch lateral line along the base of the dorsal on the front part of the body. The scales are smooth and scarcely touch each other, or at least do not overlap. The color is dark brown, usually mottled

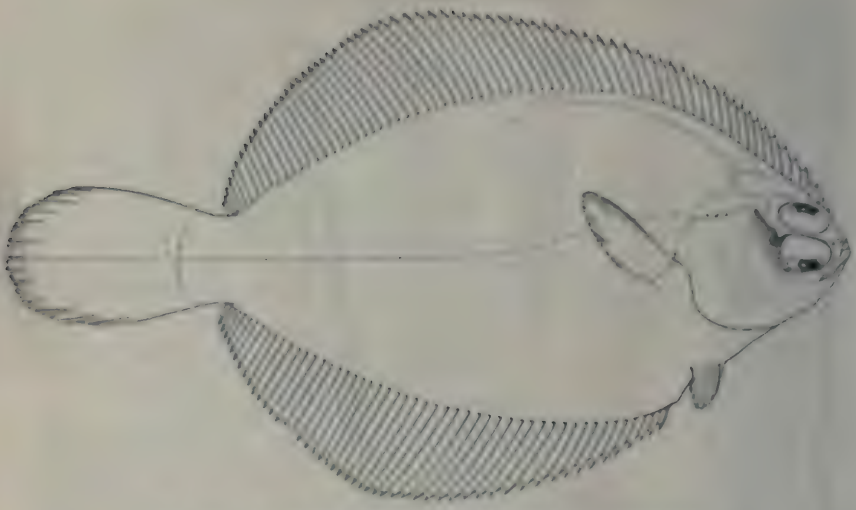

Fig. 92. The Mottled Flounder (*Pleuronichthys* ——).

This flounder is rather common in water of moderate depth. It is found along the entire California coast, and grows to be about 14 inches in length.

Ritter's Flounder (Pleuronichthys ritteri).

About five rays of the dorsal are on the blind side of the head, the lower end of the fin being on a level with the tip of the snout. The scales overlap at least on the middle of the body, and there is a branch lateral line along the base of the dorsal fin in front. There is a small dark spot on the lateral line at about the middle of the body.

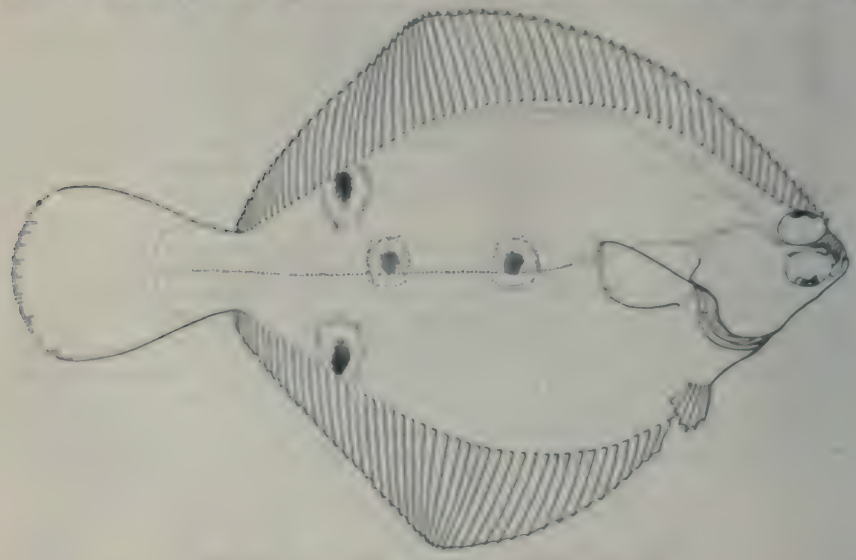

Fig. 93. Ritter's Flounder (*Pleuronichthys ritteri*).

and at each side of the body near the base of the anal and the dorsal fin towards the tail there is a similar one usually smaller. Just in front of between the last two spots there is often a fourth spot. From the sharp-ridged flounder (*P. verticalis*) and the mottled flounder (*P. cœnosus*) that also have 5 rays of the dorsal on the blind side of the head this species may be known by the character of the ridge separating the eyes and the bony protuberances on it. The ridge is not so high and sharp as in *P. verticalis*, and the front bony protuberance does not overhang the tip of the snout. It has 2 bony protuberances developed at the front of the ridge, which are scarcely or not at all developed in *P. cœnosus*.

This flounder is known from San Pedro southward to the coast of Lower California, where it replaces *P. cœnosus* on the southern coast. It is rather abundant in San Diego Bay. It is a very good food fish and reaches a length of about a foot.

The Diamond Flounder (Hysopsetta guttulata).

The body is very broad and covered with smooth, semiembedded scales that scarcely touch each other. The lateral line is not arched in front, and there is a branch lateral line extending along the base of

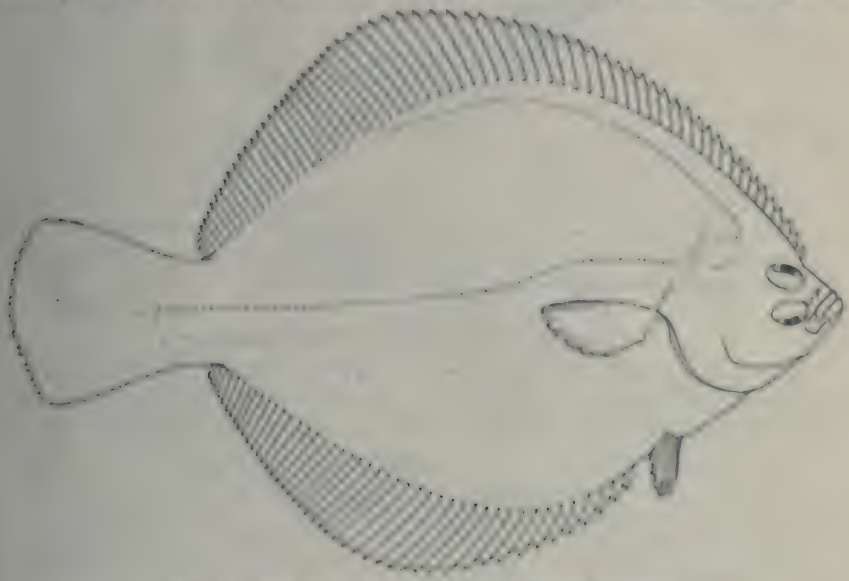

Fig. 94. The Diamond Flounder (*Hypsopsetta guttulata*).

the dorsal fin in front. The mouth is small and the maxillary does not reach to below the middle of the lower eye. The outline of the head is concave just in front of the eye. On the head the scales are scarcely developed. Small teeth are on the blind side only of the jaws. The caudal fin is large and rounded.

This is a very abundant flounder south of Cape Mendocino on the California coast and is found southward along the Lower California coast. It is a very good food fish.

Common "Sole" or California "Sole" (Parophrys vetulus).

This flounder is moderate in width, with a concave outline of the head just above the eyes. The mouth is small, and the maxillary reaches only a little past the front of the lower eye. The eyes are large and the upper one is on the upper outline of the body, so that it may be seen slightly as the head is viewed from the blind side. There is no abrupt arch at the front of the lateral line, and a branch of the lateral line runs back from the head along the base of the front of the dorsal. The scales are fine and do not feel rough as the finger is passed towards the head. The space between the eyes is narrow, but not high and sharp.

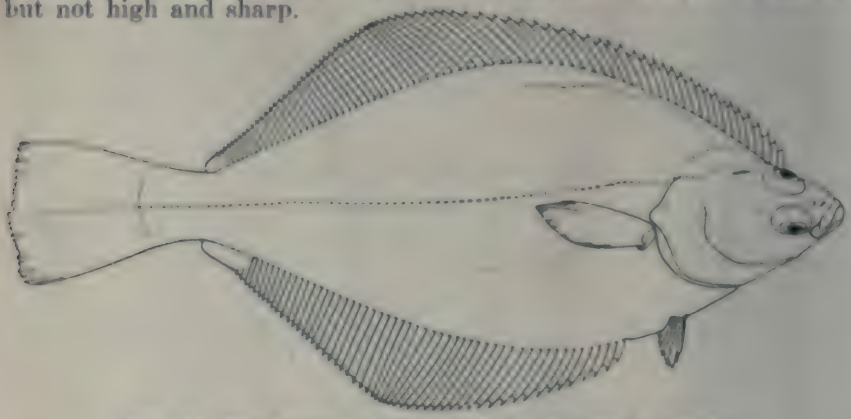

Fig. 95. The Common or California "Sole" (*Parophrys vetulus*).

This flounder in common with many others is known as a sole, and is very abundant in water of moderate depth. It is found along the entire California coast and northward to Alaska. It is small in size, but its abundance makes it of some importance.

The Scaly-Finned Flounder (Isopsetta isolepis).

This is a moderately wide flounder covered with rough scales which extend out on the fin rays and over the head. The front of the lateral line has a slight arch, but not a high one as in the flounders that are

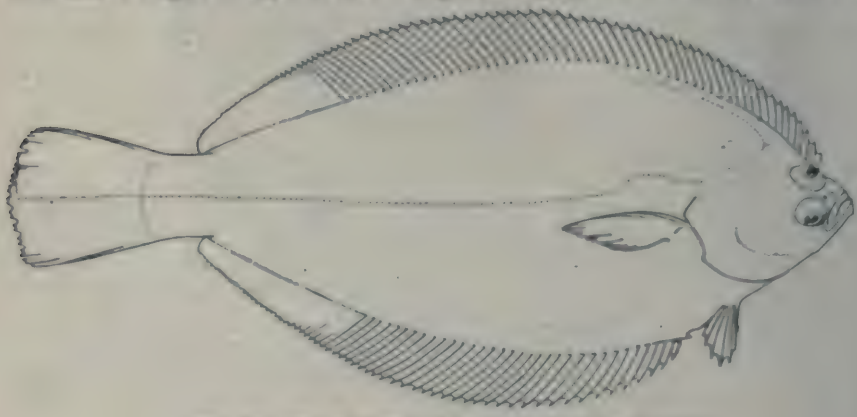

Fig. 96. The Scaly-Finned Flounder (*Isopsetta isolepis*).

here classed as having an arch at the front of the lateral line. The mouth is small and the maxillary does not reach to below the middle of the lower eye. The small eyes are separated by a moderately wide scaly space. A branch lateral line runs along the front of the base of the dorsal backwards from the head.

On the California coast this is a rather common flounder. It reaches a length of 15 inches, and is found in rather deep water from southern California northward to Puget Sound.

The Double-Lined Flounder (Lepidopsetta bilineata).

This is a very wide flounder, covered with scales of moderate size that are very rough in northern specimens, but in southern ones are sometimes almost entirely smooth. It has an abrupt arch at the front of the lateral line, and an accessory branch of the line follows the

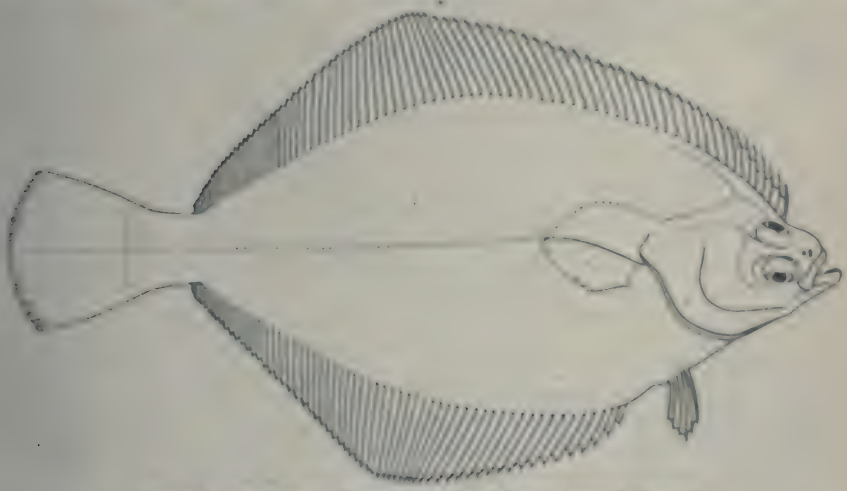

Fig. 97. The Double-Lined Flounder (*Lepidopsetta bilineata*).

base of the front of the dorsal fin. The mouth is small and the maxillary scarcely reaches to below the middle of the lower eye. The dorsal fin begins above the front of the upper eye. The eyes are moderate in size, and separated by a flat scaly area.

This is a common flounder found from southern California northward to Bering Strait, though south of Monterey Bay it is probably rare. It reaches a weight of 5 or 6 pounds.

The Starry Flounder (Platichthys stellatus).

This is a moderately wide flounder that may be known by the small rough plates scattered over the body, and by the alternate black and orange-brown spots or stripes on the dorsal, anal and caudal fins. The bony plates are larger and rougher at the base of the dorsal and anal fins where they are disposed in a single row. A rough ridge runs back from between the eyes, ending above the gill cover in a couple of rough bony protuberances. The lateral line is without an arch in front,

though it is rather strongly curved in this region. The mouth is small and the maxillary scarcely reaches to below the middle of the lower eye. The color is dark brown or nearly black, with spots or stripes on the dorsal, anal and caudal fins, formed by a few black rays, then a few orange or brownish ones, and thus alternating so that the stripes run lengthwise of the rays.

The starry flounder is one of our commonest flounders. It is widely distributed, being found from southern California to the Arctic Ocean,

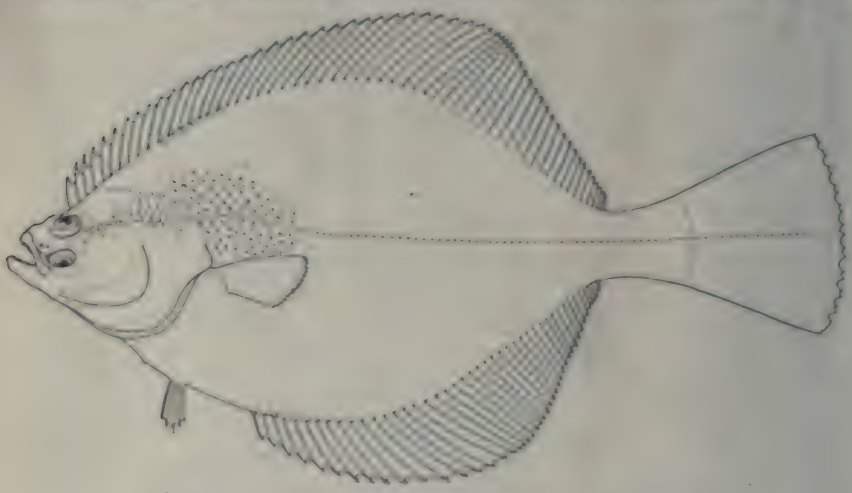

Fig. 98. The Starry Flounder (*Platichthys stellatus*).

and southward on the Asiatic side to the Amur River. It reaches a weight of 15 or 20 pounds. It lives in shallow water and sometimes ascends the larger rivers. Commercially it is one of the important flounders on account of its size and abundance, but as a table fish it is one of the poorest, being rather coarse and tasteless, and not to be compared with some of the flounders. It is almost the only flat-fish still known as a flounder, and is sometimes called "the flounder," but even it helps to form "fillet of sole."

The Slippery or Chinese "Sole" (Microstomus pacificus).

This is a slender flounder, covered with very fine scales. The mouth is very small, the maxillary reaching only a little past the front of the eye. The eyes are large and separated by a flat, scaly area. The teeth are developed on the blind side only of the jaw. They are broad and close set so that they form a continuous cutting edge. The gill opening does not extend above the pectoral fin. The lower eye is much longer than the snout.

The slippery sole is so called on account of the excessive mucous that covers it. On this account it is sometimes thrown back into the water by the paranzella-net men when other flounders are plentiful, for the mucous makes it difficult to hold in cleaning it. It is, however, one of the best flavored of the flounders. It does not reach a large size, being commonly taken from a foot to 18 inches in length. It is

Fig. 99. The Slippery or Chinese "Sole" (*Macrostomus pacificus*).

abundant in water from 15 to 20 fathoms in depth, and is found from Puget Sound southward to southern California. South of Monterey Bay it has not been reported in abundance.

The Rex "Sole" (Glyptocephalus zachirus).

The rex "sole" is a slender flounder covered with smooth, fine scales. It may be known by its slender pectoral which is much longer than the head, and the lateral line without an abrupt arch in front. The mouth is very small, with the maxillary reaching past the front of the lower eye. The eyes are very large and separated by a flat narrow space that bears fine scales. The lower eye is slightly in advance. The dorsal begins above the middle of the eye. The ventrals are small, or about equal to the long diameter of the eye in length.

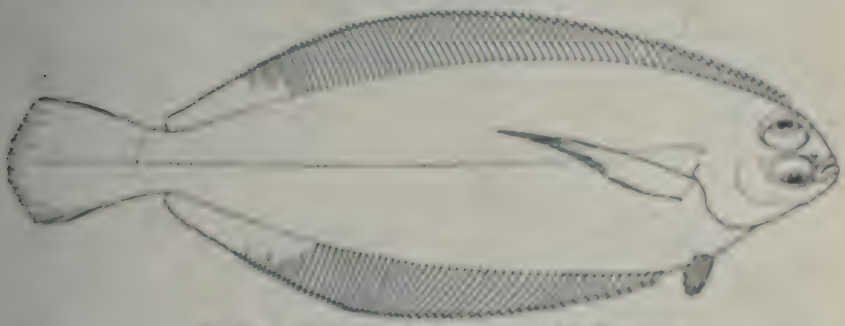

Fig. 100. The Rex "Sole" (*Glyptocephalus zachirus*).

This flounder is common in deep water from San Francisco northward to Bering Sea, and it has been taken as far south as southern California. It is sometimes caught in great abundance by the paranzella nets. It scarcely exceeds a foot in length. As a food fish it has been little appreciated, for it has been uncertain in its appearance in the markets. A fish that can not be counted upon to appear every day in the fish stalls, at least in its season, does not easily become a popular fish, for the caterers can not put it on a menu, and the menu is the chief source of advertising that a fish gets. It is now growing in favor, however, and bids fair to become an epicurean dish.

The Soft Flounder (Citharichthys sordidus).

This flounder is rather slender and is covered with large thin scales. The eyes are large, and separated by a rather wide, slightly concave space, that is highest and rises to a ridge at its lower edge just above the lower eye. The lower eye is longer than the space from it to the tip of the snout. The lateral line is without an arch in front. The mouth is moderate in size, curved, and armed with fine, sharp teeth. The maxillary reaches to below the middle of the lower eye. The dorsal begins slightly on the blind side and a little in front of the upper eye. The ventral fin of the colored side is on the ridge of the belly, and the pectoral fin is about two-thirds of the length of the head.

Fig. 101. The Soft Flounder (*Citharichthys sordidus*).

The soft flounder is found in considerable abundance from British Columbia to Lower California in water of moderate depth. It rarely exceeds two pounds in weight. Its flesh is rather soft and as a table fish it has not been reported upon.

Speckled Flounder (Citharichthys stigmaeus).

This and the soft flounder may be known by the ventral fin of the eyed side being on the ridge of the abdomen. It may be known from the soft flounder by the character of the space between the eyes, which in this species is narrow, not concave, and not rising to a ridge just above the lower eye, and by the lower eye being about equal in length

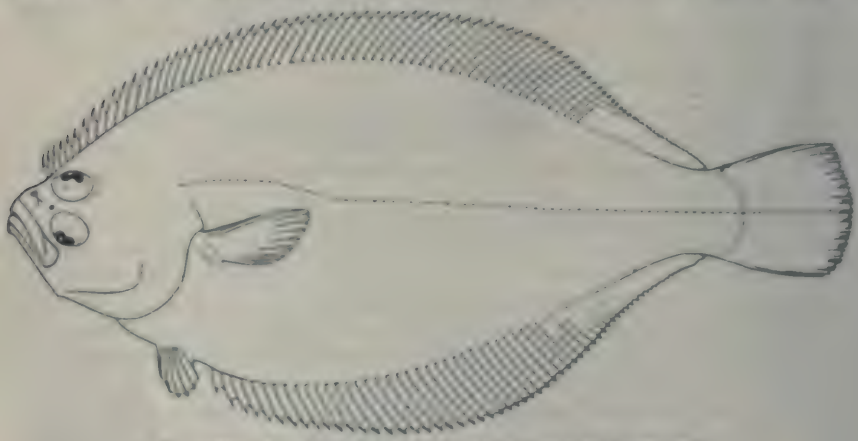

Fig. 102. The Speckled Flounder (*Citharichthys stigmaeus*).

to the space between it and the tip of the snout. The dorsal fin is rather high in front and begins somewhat on the blind side opposite the front of the eye. The lateral line is not arched in front. The maxillary reaches to below the middle of the eye.

The speckled flounder is a small rare flounder, known from San Diego to Oregon, and is found in rather deep water. Specimens have been taken that were full of spawn when at a length of only 5 inches. It is commercially of no importance whatever.

FAMILY SOLEIDÆ.

The Tongue Sole (Symphurus atricaudus).

This is the only true sole we have on our coast. It may be known at once from all of the other flat fishes by the shape of the body, which is blunt at the head end and tapers to a point behind as in the accompanying figure.

Fig. 103. The Tongue Sole (*Symphurus atricauda*).

This sole is found from southern California southward along the lower California coast. In San Diego Bay it is rather common. On one or two occasions specimens have been taken as far northward as San Francisco. It does not exceed 6 inches in length.

ON COMMON NAMES OF FISHES.

By E. C. STARKS.

The paper on mackerel and mackerel-like fishes that appeared in the July number of CALIFORNIA FISH AND GAME has called forth considerable discussion as to the use of the names skip-jack and bonito.

It is difficult to say what is the correct use of the common name of a fish, such names not being governed by any rules, as are scientific names. A fish that is known by a certan name in one locality may bear an entirely different one in another locality; or the same name may in two localities refer to entirely different fishes; or names may be exactly reversed so that "a" becomes "b" and "b" becomes "a."

The mackerel of our coast is known on the Atlantic coast as chub, thimbleeye, and tinker, according to locality. In England it is known as the Spanish mackerel—a name I have heard applied to it in southern California. In America the name Spanish mackerel is more usually applied to a fish of the genus *Scomberomorus*. Now, no one can say which of these fishes has a better right to the name Spanish mackerel.

In America we shall continue to apply that name to members of the genus *Scomberomorus* wherever they may be found. But has it as good a right to the name as the fish called Spanish mackerel in England (our mackerel) which probably was first so called? Great numbers of examples could be quoted illustrating this confusion in the use of common names.

The name oceanic bonito has always been applied to the fish I have designated, until within recent years. In Australia, England and many Atlantic ports it has always been known as bonito. Cuvier so called it in 1831 in France, where it is still so called. In southern California, when these fishes became of commercial importance, the old names seem to have become confused. This came about when the interest was transferred from the anglers, who had a greater interest in the fishes for themselves, to the fishermen and dealers. Oceanic bonito as applied to *Euthynnus* is the best name because it is used by the greatest number of people and over the greatest part of the world; for it is a widely distributed fish. The fish called skipjack is not found in the Atlantic, though it has close relatives there. These relatives go by the name of bonito, and our representative might well be called California bonito, were it not that that name is so easily confused with oceanic bonito. This fish used to be called skipjack on our coast (a name applied to various silvery, jumping fishes in different parts of the world) and though in recent years the names skipjack and bonito seem to have been interchanged in southern California it has been restored as the best available name.

We are given to understand that the Bureau of Chemistry proposes to can *Euthynnus* under the name of striped tuna. If so, this name is to be deplored, for it is not a tuna. Not only does it belong to a different genus, but certain features of its anatomy are so strikingly different from that of the tuna that it may be placed in a different subfamily. Canning the albacore under the name of tuna has led to so much confusion that no one knows whether the albacore or the tuna is referred to when the name tuna is used.

In the papers on the fishes of California, being published, it is the intention to use the common names that are the most universally used, unless there are reasons against such use. For instance, there are very good reasons against the use of the name English sole, for the fish we call by that name is not a sole and it in no way resembles the English sole. Very often, as among the flat-fishes, there are no common names. In these cases either the meaning of the scientific name is used as a common name or some name referring to some character of the fish is used—as, spotted flounder.

Common names of fishes have been transferred from one locality to another. When our ancestors came from Europe and saw certain fishes on our Atlantic coast that a had a more or less close resemblance to the fishes they were familiar with, they named them accordingly. In the same manner the common names of our Pacific fishes came from their resemblance or imagined resemblance to Atlantic fishes, and the names have been good or poor depending upon the acuteness of observation of the men who named them. Thus the names in different sections of the same coast vary according to a fancied resemblance of the fishes that bear these names to other fishes, as seen by different people.

THE SPAWNING OF THE LITTLE-SMELT, LEURESTHES TENUIS (AYRES).

By P. S. BARNHART, Scripps Institution for Biological Research.

We have known for a number of years that the little-smelt, *Leurestes tenuis* (Ayres), appears in immense schools on all sandy beaches near San Diego at a certain time each year when it may be picked up from the sand in quantities. Hubbs (1916) prints a letter written to him by J. B. Joplin of Santa Ana, describing the breeding habits of this fish. Mr Joplin wrote:

> "Three months during the year, usually March, April and May, on the second, third and fourth nights after the full moon, at full tide, great schools of them come out in the breakers, at the mouth and for half a mile on each side of where a small fresh water stream flows into the ocean, for the purpose of depositing their eggs or spawn in the sand. The water recedes and when the fish are not disturbed they wiggle tails down in the sand, as far out as the force of the water will carry them, both males and females—sometimes as many as eight or ten together—where the crust of the sand is broken. Sometimes only one female is found with just her head visible."
>
> "Why they come out at night, which is usually from ten to one o'clock, and the run usually lasts three hours or longer, is a question."
>
> "I have been observing them for thirty years and the time of their coming is so regular that during that time I have rarely missed them."

Although these facts have been known for a number of years and many people go to the beaches to gather the fish that have appeared to be cast up by the waves, so far as I know no further observations have been made of the incident and its significance. My attention was called to it a year ago when some of the fish were given to me and an examination of them showed that they were in spawning condition. It was then too late for investigation, as the last run was over, and I had to wait until this year to make these observations, which coincide in the main with the remarks in the above letter.

The nightly run begins within a few minutes of the time when the tide is at its highest point and lasts for several hours. The fish shoot in with an incoming wave, sometimes forcing themselves up the slope of the beach by wiggling and flipping until a favorable place is found, rest quietly a moment while depositing milt or eggs, begin wiggling again in the sand and finally flip back or shoot back with the next high wave that reaches them. They must have a good sense of direction for out of the immense quantity which come ashore at these times not one remains on the beach. Sometimes they half bury themselves in the sand horizontally, and I have found many of them with their bodies buried vertically right up to the pectoral fins. The greatest numbers were found in the riffles or run offs where they crowded in and made quite a commotion. Samples of the sand taken in such places were full of

eggs. So far as I was able to observe there was no pairing of males and females.

Collections taken at different points along the beach showed that the males were in the majority by more than two to one over the females. This is directly opposite to the general condition supposed to exist among fishes. The method of spawning here described nevertheless must entail an enormous wastage of fertilizable eggs, as sometimes there are only a few seconds between the wash of the waves when the sperms and eggs are mixed in the sand by the movements of the fish and then carried off the beach by a receding wave.

The eggs are 1.8 to 2 mm. in diameter, contain a large number of reddish yellow oil drops and are demersal. In all other species of Atherinidæ so far observed the eggs are provided with delicate filaments for attachment to each other and to eel-grass and seaweeds. In this species, however, the eggs have no filaments and are entirely free from each other. The capsule is smooth and hard so that particles of sand do not adhere to it, and the egg is so heavy that it stays on or very near the bottom until hatched.

This inshore migration of *Leuresthes tenuis* has, so far as I know, only been noted on the sandy beaches between Point Loma and Newport, and are independent of the presence of freshwater streams. It would be interesting to know just how far north and south of these points it extends.

RARE FISH APPEAR OFF SOUTHERN CALIFORNIA.

By WILL F. THOMPSON.

This year has been a very unusual one in many respects in southern Californian fisheries. The albacore run has been a failure during August and very disappointing during July. The total for July of last year (1917) was probably greater than that for the whole season thus far when albacore alone is considered. The lack of albacore has to a very small extent been alleviated by the appearance in unusual numbers of other species, some formerly rare or unknown in our waters. Notable among these are the skipjack (*Euthynnus pelamis*)* and the yellowtail (*Seriola dorsalis*). Some of the canneries are taking great quantities of mackerel (*Scomber japonicus*), but the market for them appears to be sufficiently doubtful to hinder the free use of them by all firms. Among the mackerel are frequently found considerable numbers of the horse-mackerel (*Trachurus symmetricus*), which is not a true mackerel, although it is canned with them. The blue-fin, or leaping tuna (*Thunnus thynnus*) has also been taken in considerable numbers, chiefly by the purse seiners, and more especially in the earlier part of the summer. The albacore fishermen seem to obtain isolated individuals of the tuna, but not great numbers of them. Those caught by the purse seiners are fairly small, one large catch, for instance, averaging under ten pounds apiece. This contrasts greatly with the extreme weights reached of 200 or 250 pounds. It will be remembered that last year was the first year in which the purse seiners caught great numbers of

*The common name here used is the one most often given the fish in southern California. This fish is sometimes called the oceanic bonito.—*Editor.*

this species, one fisherman losing a part of his net due to the weight of the fish he had impounded. Altogether, the year has been thus far an unusual one indeed, contrasting greatly to the usual one in which the albacore has formed the predominating species caught at all times during its season. If it were not for the sardines, the canneries would undoubtedly have a very short year.

The impression one has of an unusual year is greatly heightened when some of the rarer forms which have been brought in are considered.

The dolphin, one of the most beautiful fish ever taken in these waters, has formed a considerable addition to the catches of the sportsmen at Catalina, and has come in to the canneries in numbers at times, despite the fact that there is no market for them there. It has been recorded from various points on the southern Californian coast by scientists in previous years. Two were caught and presented to the writer last year. It is the *Coryphæna hippurus* Linnæus of all warm seas.

The yellow-fin tuna has also been unusually abundant this year, as many as fifteen specimens having been brought in by a single fishing boat at a time. It has been much confused with the albacore and the real tuna by the fishermen and the cannerymen. The pectoral fin on the side is median in length, between that of the blue-fin tuna and that of the albacore, and the body has a strong lemon tinge everywhere, especially on the fins. It has faint reticulations below the lateral line similar to those of the young blue-fin tuna, forming indefinite stripes transverse to the body axis. In this respect it differs from the albacore, which has indefinite longitudinal arrangements of this pattern. It is commonly held to be a member of the albacore genus, rather than that of the tuna, although all three are undoubtedly so close together as to be rather members of the same genus.

Another rare fish, previously unknown in our waters, and in fact not known from Mexican waters, is the frigate mackerel (*Auxis thazard*). This has been taken in small numbers very recently, and so far as known for but a short period of time from various localities around Catalina and San Pedro. It has been described from Japan, the East Indies and the Mediterranean. It is very small and much resembles the skipjack (*Euthynnus pelamis*) save in the fact that the dorsal fins are widely separated and the colors are different, the stripes being absent and a mackerel coloration being present above the lateral line. Its appearance caused considerable excitement among the older hands at the canneries and in the markets.

HUNTING WITH BOW AND ARROW.

By SAXTON POPE.

You think it absurd when anyone tells you that he hunts with a bow and arrow.

Of course, all kids shoot with a bow and arrow, but then they never hit anything. One fellow in a sporting journal, recently said: "I never saw an archer that could scare game, much less kill any."

We think hunting with bow and arrow is not only possible, but demonstrate that it is possible by going out and getting the game.

For the past three years W. J. Compton, Arthur Young and the writer have been hunting with the long bow. We make our own weapons of Oregon yew. They are the height of a man and pull fifty to eighty pounds. The string is made of Irish linen; one strand of Bulbours No. 12 for every pound of pull. This is well waxed and twisted.

The arrows used for hunting are made of birch dowels five-sixteenths or three-eighths of an inch in diameter and twenty-eight inches long.

Some arrows for shooting small game are blunt-pointed. They are

Fig. 104. Quail shot with bow and arrow by Messrs. Young and Compton at twenty yards. A hard aperce for a shot aperce. Buck killed with long bow. Photographs by Saxton Pope.

made by inserting a round headed screw in the shaft and binding the end with fine wire.

Arrows for killing large game have a steel head, shaped in the classic triangle, an inch and a half long and one inch broad. These are kept very sharp by filing them. We carry about three dozen on a hunting trip and shoot some many times.

We have hunted all sorts of game, bagging scores of quail, rabbits and squirrels. Foxes, coons, skunks and other predatory varmints have been taken into camp. These have been shot at distances ranging from ten to fifty yards.

In one afternoon Arthur Young killed seventeen ground squirrels with the bow. The last five of these animals he killed with five successive arrows.

In the line of big game, at present we have gone no further than the festive buck, but in the past three years we have killed a half dozen deer. Two years ago in Monterey County, Compton shot a running buck at 75 yards, and drove an arrow through his shoulder,

up to the feather. This deer dropped after plunging down the canyon a couple of hundred yards.

Last season Mr. Young got a three pointer at 60 yards by a shot in the flank. The deer jumped a ravine and sought shelter in a bunch of bay trees. Young landed a second arrow through the chest and put him out of commission.

On the same trip, the writer shot a forked horn at 65 yards, driving an arrow clean through him and flying twenty yards beyond. The deer ran some thirty more yards, staggered and was killed by a shot

Fig. 105. Forked horn buck shot with long bow by Saxton Pope at sixty-five yards in Monterey County, September, 1918. The first arrow penetrated the deer completely, the second is seen sticking through the chest.

through the heart, as you see in the picture [Fig. 105]. He dropped without a struggle.

An arrow in the chest, or abdominal cavity, kills as quickly as a bullet, and seems to make more hemorrhage. If it strikes muscle or bone, it makes a clean cut wound and does little damage.

Altogether, we feel that it is a clean, fair sport. It requires more careful hunting and gives the game an even chance. After all, this is the essence of sport, that there should be a contest of skill, strength and cunning between the quarry and the hunter. It is not the size of the bag that counts, it is the fairness of the contest.

Archery is difficult to master, but it is a noble and romantic art.

CALIFORNIA FISH AND GAME

A publication devoted to the conservation of wild life and published quarterly by the California State Fish and Game Commission.

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All material for publication should be sent to H. C. Bryant, Museum of Vertebrate Zoology, Berkeley, Cal.

October 25, 1918.

Back of protective laws must be a healthy public sentiment, prompting every person to take the minimum rather than the maximum, and only under conditions which will permit of using all for food.—Illinois Sportsman, June 6, 1918.

ALL READERS TAKE NOTICE.

Owing to many changes of addresses it is necessary to revise our mailing list. Enclosed with this number of CALIFORNIA FISH AND GAME is a post card which everyone interested in receiving the quarterly should fill out and return promptly. Unless this card, properly filled out, is received before the next number is ready for mailing, your name will be removed from the mailing list. Those who are not interested enough to sign and send in the card are the ones we wish to eliminate from the list.

WOULD SLAUGHTER DUCKS.

During August and September the newspapers published numerous articles dealing with the destruction of rice caused by ducks. The noticeable feature of the greater part of the articles was the suggestion that the season should be opened and the ducks put on the market. Attention was focused on the sale of ducks, not on the protection of crops. Before the rice growers attempted any protective measures the Fish and Game Commission began experimenting with bombs and fireworks. As a result a simple and effective method of driving ducks from rice fields has been worked out. And this method is much less expensive.

If Congress stopped long enough during war time to pass a needed conservation measure it can not be expected that a handful of rice growers bent on slaughtering game for profit will be able to modify a law designed to benefit all the people. Practically all of the ducks coming to California during the winter season are birds which have been raised to the north of us. By international agreement we are allowed only a fair share of these ducks and fairness to the others involved demands that ducks be not slaughtered for profit.

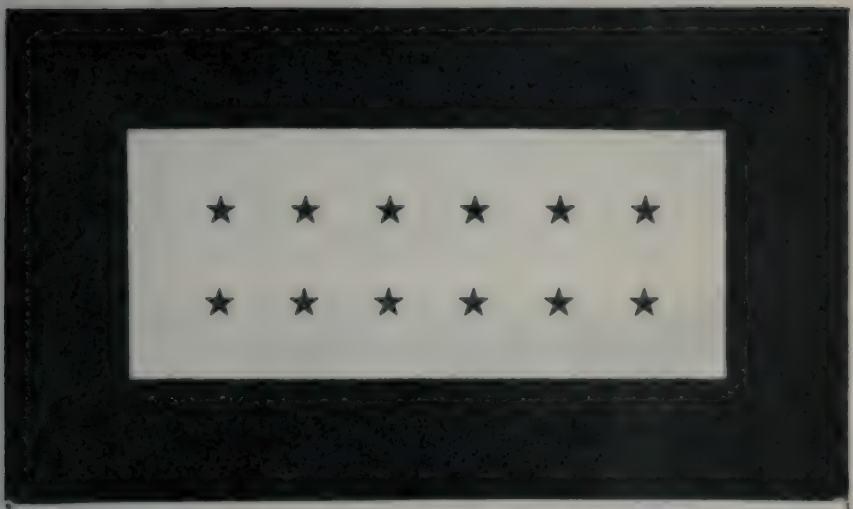
Fortunately, most rice growers realize that a means of protecting crops which will involve a small expenditure and a few men is much to be preferred over turning a bunch of market hunters into the rice fields.

BOY SCOUTS TAUGHT CONSERVATION.

This past summer most of the boy scouts in California have had an opportunity to become acquainted with the great out-of-doors in the many summer camps which have been established. Some of these camps have been in the nature of training camps of scouting, whereas others have been established as an aid to agriculturalists, the boys picking fruit or doing other agricultural work. In the training camps, each morning has been devoted to classes in scouting. The Fish and Game Commission has made it possible for many of the different camps to receive instruction in nature study and game conservation. A competent instructor has taken the boys on field excursions and taught them to recognize the different kinds of birds and animals at sight and by sound, and has given them talks on game conservation around the camp fire. Many of the boys accepted the opportunity offered and passed tests entitling them to the merit badge in conservation.

Great interest was shown at each camp where this work was instituted and many were the recruits for the army of defense formed to protect wild life. Nothing can be more fundamental in bringing about proper conservation than work of this kind.

OUR SERVICE FLAG.



E. NEILSEN
E. W. BOLT
H. L. NEHF
H. R. DUNBAR
V. GOODMAN
CLAUDE CHRISTIANSON
CLARENCE CHRISTIANSON
M. S. HEMEY
E. CLESSENS
C. HILLARD
R. ELKINS
C. O. WARD

IMPORTANT PROVISIONS OF THE MIGRATORY BIRD TREATY ACT.

Sec. 1. Title: The Migratory Bird Treaty Act.

Sec. 2. Taking, killing, transportation or sale of migratory birds or their nests or eggs is prohibited.

Sec. 3. The Secretary of Agriculture has power to authorize from time to time the killing or capturing of certain species or extend the season, etc. These authorizations become effective only when approved by the President.

Sec. 4. Shipment of protected birds, eggs and nests from one state, province or territory into another, or exportation and importation is prohibited.

Sec. 5. Violators may be arrested without warrant by an authorized agent of the Department of Agriculture and brought to trial. Birds, eggs and nests seized from such persons are confiscated and disposed of by the court.

Sec. 6. A convicted person shall be guilty of misdemeanor and shall be fined not more than $500 or imprisoned not more than six months, or both.

Sec. 7. States may make additional laws for protection as they see fit.

Sec. 8. For scientific purposes migratory birds may be killed or captured; they may also be shipped if packages are clearly marked.

Sec. 9. Unexpended balances of money appropriations are reappropriated to be expended for expenses of carrying into effect the provisions of the act and for payment of rent, salaries, etc. Employees are not exempted from the military draft.

Sec. 10. If any clause of the act is held invalid by a court, that shall not affect any of the other clauses.

Sec. 11. All acts or parts of acts inconsistent with the act are repealed.

Sec. 12. The breeding of migratory game birds on farms and preserves for purpose of increasing the food supply is permitted under proper regulations.

Sec. 13. The act becomes effective immediately upon its passage and approval.

WHAT IS EXPECTED FROM THE NEW FEDERAL LAW.

The treaty made effective by enabling legislation for the first time provides everywhere absolute protection to migratory nongame birds, both those which are valuable to agriculture and the others which add charm to the outdoors. Secondly, it terminates forever the selfish and spendthrift attitude of certain sections of the country which, while adequately protecting their localized game, exercised no forbearance whatever where the migratory game was concerned. Such sections acted on the theory that it would only be a short time before the migratory game was exterminated and that it was better to let their citizens take as much of it as they could while the supply lasted, without reference to breeding seasons or the rights of others or any economic or co-operative conditions whatever.

In addition to this, under the new law the police powers of the agents of the Department of Justice are defined and made effective. The sale of migratory game will be prohibited and suitable bag limits established. Encouragement will be given to the propagation of wild game under suitable regulations and the necessary permission for scientific study will be granted. Any species of birds which increase to such an extent as to be destructive to agricultural interests may be reduced in numbers by a regulation of the Secretary of Agriculture.

Already under the most unfavorable conditions splendid results are apparent in this country from the passage of the original migratory bird law in 1913. Under the beneficent influence of this regulation practically all species of birds have increased. Waterfowl in particular have responded to the added protection to an amazing degree. Everyone is so familiar with this fact that it is needless to amplify its discussion.

As regards the game birds, it is the policy of those having to do with the regulations to equalize opportunity for all sections of the country in so far as natural conditions permit. The flexibility of the new law is another strong feature in its favor, as when any particular kind of game bird increases or decreases the open season and bag limits can be increased or decreased to suit the situation. Closed seasons can be established where game is in need of absolute protection.—JOHN B. BURNHAM.

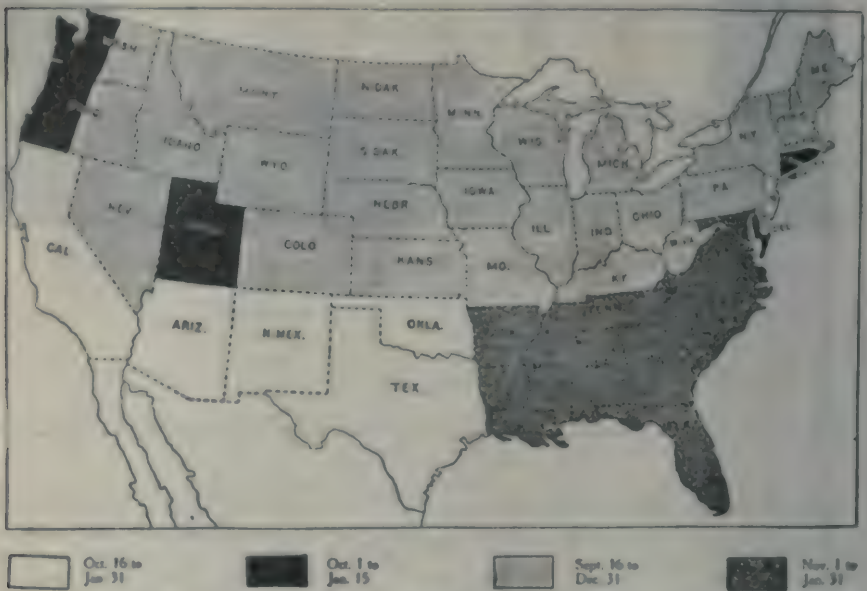


Fig. 106. Seasons under the new Migratory Bird Treaty Act Regulations, effective July 31, 1918.

THE DANGERS OF THE BOUNTY SYSTEM.

Since the burden of expense of bounties for the destruction of noxious animals falls on the community at large, the question arises as to how far this method of extermination has been successful, and whether the results warrant its continuance. The value of bounties is not admitted by all, and complaints of the failure of the laws and lack of real protection are often made by those who should be most benefited by them. The most serious objections, however, are the great expense which is often out of proportion to the benefits obtained, and the chance for fraudulent misrepresentation which it affords.

As regards the expense of this method, the coyote act of our state, which went into effect March 31, 1891, and was suspended September 30, 1892, after $187,485 had been expended and little had been accomplished, is an example of the fate which much of our recent bounty legislation has suffered. It is, therefore, safe to say that the $3,000,000 which have been expended for bounties in the United States during the last 25 years did not give results that corresponded in any way to the outlay. As regards the chance for fraud, the unequal bounties maintained on the same animals in adjoining counties or states often lead hunters to fraudulently transport the scalps to districts where a higher bounty is paid. Thus, thousands of coyote scalps were imported into California, where under the above mentioned act a bounty of $5 was paid, from Nevada where only 50 cents was paid for the scalp of this animal.

Fig. 207. Boy Scouts encamped in Yosemite receiving instruction on fish and fishing. Photograph by H. R. Wilson, June, 1918.

But there are other disadvantages inherent in the bounty system. For instance, it is often impossible to maintain bounties over the entire range of the animal that is to be exterminated. This is particularly true when the animal's range reaches into neighboring counties or states which pay no bounty and, therefore, favor their multiplication. Again, the animals to be exterminated may often be more useful than harmful. We have only recently come to realize this fact

in the case of owls, crows and other birds on which bounties were paid in several states.

Where predatory animals are a sufficiently adverse factor and not too numerous to deplete the treasury, the bounty system may be of more value. The state bounty on the mountain lion and the county bounties on coyotes during outbreaks of rabies are cases in point. This much can also be said for the bounty system: No matter what the actual result in property saved may be, it lets everyone know that something is being done, which adds greatly to the temper of the population.

The list below shows the total amounts of bounties paid in California during 1917. The estimates which had to be made in several cases are, if anything, very conservative, and it is therefore problematical whether the expense was in proportion to the damage prevented which these animals (mostly coyotes, wildcats and mountain lions) would have caused. The bounties paid by each county are also given.

BOUNTIES PAID IN 1917.

County.	
Amador	$843 90
Butte	744 00
Calaveras	568 00
Colusa	1,447 50
Humboldt	4,224 00
Kern	90 00
Lassen	†2,000 00
Madera	1,489 50
Mendocino	4,300 00
Merced	2,404 00
Modoc	2,650 75
Mono	4,224 00
Nevada	395 00
San Joaquin	1,000 00
Santa Barbara	2,404 00
Shasta	2,240 00
Sierra	422 50
Siskiyou	*2,520 00
Solano	330 00
Sonoma	390 00
San Luis Obispo	2,687 05
Sutter	130 00
Tehama	6,030 00
Trinity	1,155 00
Tulare	*4,335 17
Tuolumne	613 00
Ventura	†1,000 00
Yolo	855 00
Yuba	1,015 00
	$53,567 97

*Fiscal year, July 1, 1917-June 30, 1918.
†Yearly average.

Fig. 108. California Gray Squirrel (*Sciurus griseus*), a splendid game animal, the season on which opens September 1. Reproduced from a copyrighted photograph by J. F. Boysen.

BOUNTIES OFFERED ON PREDATORY ANIMALS, 1918.

County and species	Bounty
Alameda	None
Alpine	None
Amador—	
Bisetay	$0.05
Magpies	.05
Coyote	2.00
Crow	.25
Fox	.25
Skunk	.25
Butte—	
Coyote	3.00
Calaveras—	
Coyote	2.00
Colusa—	
Coyote	10.00
Coyote pups	2.50
Lion	5.00
Fox	2.50
Buzzard	1.00
Contra Costa	None
Del Norte	None
El Dorado	None
Fresno	None
Glenn—	
Coyote	5.00
Humboldt—	
Coyote	8.00
Imperial	None
Inyo	None
Kern—	
Mountain lion	5.00
Kings—	
Coyote	2.00
Lake	None
Lassen	None
Los Angeles	None
Madera—	
Jackrabbit	.02½
Coyote	1.50
Rabbit	.02½
Bisetay	.02½
Marin—	
Coyote	20.00
Wildcat	2.50
Mariposa—	
Coyote	1.50
Wildcat	1.00
Mendocino—	
Coyote	6.00
Merced—	
Coyote	2.00
Modoc—	
Coyote	2.50
Wildcat	1.00
Rabbit	.05
Mono—	
Coyote	1.00
Monterey	None
Napa—	
Coyote	2.00
Wildcat	2.50
Nevada—	
Coyote	$2.50
Orange	None
Placer	None
Plumas	None
Riverside	None
San Benito	None
San Bernardino	None
San Diego	None
San Joaquin—	
Coyote	2.50
San Luis Obispo	None
San Mateo	None
Santa Barbara—	
California lion	20.00
Coyote	2.00
Santa Clara	None
Santa Cruz	None
Sacramento	None
Shasta—	
Coyote	5.00
Sierra—	
California lion	5.00
Wildcat, lynx	2.50
Coyote	2.50
Siskiyou—	
Coyote	$2.50
Wildcat, lynx	2.50
Lion, panther	30.00
Solano—	
Coyote	10.00
Sonoma—	
Coyote	5.00
Stanislaus—	
Coyote	2.00
Sutter—	
Coyote	10.00
Sheep growers also pay	10.00
Tehama—	
Coyote	5.00
Coyote pup	2.50
Wildcat	1.00
Trinity—	
Coyote	3.00
Tulare—	
Coyote	2.00
Tuolumne—	
Lion	3.00
Coyote	2.00
Wildcat, lynx	1.00
Ventura	None
Yolo—	
Coyote	20.00
Wildcat	2.50
Yuba—	
Coyote	5.00

BIRD STUDY FOR BOY SCOUTS.

In order to stimulate interest and promote the knowledge of bird life, the organization of Boy Scouts of America has been awarding a merit badge in bird study to those scouts who successfully pass a prescribed test. This test provides that the scout must, among other things, prepare a list of fifty species of wild birds, a list giving the greatest number seen in one week, and a list of twenty species valuable to agriculture. All of these must have been observed personally. He must, besides, prepare a list, from personal reading, of ten birds of prey and of ten species useful in protecting trees, and further must have been actively engaged in the protection of bird life.

This is apparently a rather difficult test for boys fourteen or sixteen years of age, for it not only requires close personal observation of bird life but some reading and practical work in conservation as well. The practical conservation work may include such things as the prevention of the slaughter of birds, the promotion of closed seasons for vanishing species, or the promotion of the establishment of bird preserves and sanctuaries.

Notwithstanding these requirements, the test was recently passed by two Oakland scouts, and will undoubtedly be passed by others in the near future.

Work of this kind among the growing generation, the focusing of attention upon the necessity for conservation at an early age, is perhaps the most effective means of producing a public opinion favorable to the protection of our birds.

MANY FISH RESCUED.

A seining crew under the direction of W. J. Green of the Sacramento Division has just completed the work of seining many young fish from Paradise Cut, San Joaquin County. The ponds consisted of land-locked holes in an area of 3¾ miles. The water in the deeper ponds will remain permanent until a new flood of water comes, so it was not necessary to remove the fish from these ponds, as they will go out with the next freshet. The most important of those species saved were:

Shad, 2" to 4" in length	2,500
Striped bass, 2" to 6" in length	450
Black bass, 4" to 5" in length	300
Catfish, 3" to 6" in length	12,000
Several species of blue gill, sunfish and crappie	65,000

GEORGE NEALE.

WILD PIGEONS STILL PROTECTED.

In the treaty with Canada wild pigeons, the wood duck, and the little brown and sandhill cranes, are to receive total protection for ten years. As a consequence there will be no open season on band-tailed pigeons or the other birds mentioned, despite the fact that the period of protection afforded by state law has expired.

The fact that one must read the treaty, the enabling act and the regulations to be conversant with the new federal law regarding migratory birds has led to considerable confusion.

DEER ANSWER TO BREAKFAST CALL.

Wild deer answer breakfast and dinner calls in the giant redwoods. Under the towering trees, 300 feet high and as thick as 35 feet, stands the cabin of a man who calls the bucks and does from their mountain haunts to feed. A. M. Weaver, deputy warden of the state redwood park, has succeeded after seven months' patient effort in gaining the confidence of the limpid-eyed children of the forest. The following is vouched for by Deputy J. L. Bundock of the Fish and Game Commission:

Early in the morning, or at 6 o'clock in the evening, campers and visitors hear a loud call: "Come baa-aa-by, come baa-aa-by," from the heart of the forest. Soon after this the fleet deer are seen bounding through the redwoods. They come within a few yards of the deputy warden and patiently wait until he finishes his call for others he expects, and finally throws to them cut pieces of apple. Should a stranger walk within their sight the deer wheel and bound away, returning only when Mr. Weaver calls, and after the moving person has either stopped or walked out of sight. Then they cautiously move up to Mr. Weaver and partake of his titbit offerings. Lettuce and vegetable parings form the next portion of the meal, and finally Mr. Weaver will walk toward a large

fallen redwood giant, where stands a shallow trough. The deer trot almost at his heels. Mr. Weaver spreads barley in the trough and the deer walk up to it and feed like mules.

An old doe will paw away the younger deer and feed on the thickest of the barley. They use their feet in fighting and quite often the old does seem viciously hoggish.

Last November the warden discovered the deer were following him to eat apple parings he might drop, and months of patience in accustoming them to his voice and motions have been rewarded with their answering his calls for breakfast or dinner.

The greatest number at one time that yet have answered the call is 14. Never has the call sounded with less than one coming.

During the spring the bucks dropped off, going in velvet, and Mr. Weaver does not expect them to return until their horns are hard. Does dropped off but returned within three days after finding their young. Mr. Weaver says they hide their young and come to feed, and hopes that soon the doe will bring the young in to feed with them.

Several times the deer have been driven out of the Big Basin by hounds, and several that had come to feed were lost this way, according to the warden. Deer are protected within the state park and loose dogs or firearms are prohibited.

Of those who visited the park this year, including many sportsmen, there were none who had heard of wild deer being called in to feed, and Mr. Weaver is probably the first man earning the distinction as a feeder of wild deer who can call them to their meals.

AMERICAN FISHERIES SOCIETY POINTS OUT CONSERVATION MEASURES.

At the last meeting of the American Fisheries Society, which has as members all those actively interested in fisheries conservation in this country, a Committee on Resolutions was appointed. This committee has drafted the following resolution which appeared in the March, 1918, number of the Transactions of the Society:

Report of Committee on Principles of Legislation Relative to Proper Utilization of Fisheries Resources.

WHEREAS, Under the stress of present conditions the nation has been brought to look carefully into the character and the amount of its various food supplies; and

WHEREAS, In the past it has, through lack of attention, failed to appreciate in any real sense the significance of its food fishes and the opportunities afforded by its numerous and varied water bodies to produce a large and important element for the food supply of the nation; and

WHEREAS, We, members of the American Fisheries Society, in session at the Forty-seventh Annual Meeting held at St. Paul, Minnesota, by virtue of our contact with the fishing industry and knowledge of its problems and opportunities, being thus aware of the dangers in the situation and cognizant of the various lines in which the nation can be benefited at the present time, desire to record in formal manner those fundamental principles which appear to be essential to wise legislation and to effective work for the proper utilization of the fishing resources of the nation, and do accordingly express these views; and

WHEREAS, Under the stress of war conditions expert advice and trained supervision is even more necessary than in ordinary times; and

WHEREAS, Hasty or inexperienced action may easily result in the depletion of natural resources which can not be restored within a long period of years; and

WHEREAS, In the staff of the United States Bureau of Fisheries, and in the trained experts of the state bureaus, commissions and hatcheries, the country is possessed of a body of highly trained men devoted to the needs of the nation as a whole and qualified to speak on special problems of fisheries in the war with the knowledge and experience that will guard against the evident danger of hasty action; and

WHEREAS, Proposals have been made to suspend or revoke laws for the regulation of fisheries which have grown out of long experience and careful study of conditions regarding the habits, growth and multiplication of fish on the one hand, and the practical conditions of the fishing industries on the other hand; and

WHEREAS, The shad, striped bass, and other anadromous species have decreased in some rivers almost to the point of extinction, because of fishing devices operated in the salt and brackish waters through which they must pass to reach their natural spawning grounds in fresh water; and

WHEREAS, Artificial propagation of these species is impossible and natural reproduction is prevented unless a reasonable supply of such fishes is allowed to reach their natural spawning grounds in fresh waters; therefore be it

Resolved, That the expression "letting down the bars," as applied to the fishery resources of the country, is unfortunate; national welfare demands the greatest development of the said fisheries, including fish culture and the artificial propagation of food fishes to the highest possible point of efficiency;

Resolved, That commercialization of the so-called game fishes is not conducive to their proper conservation, but would tend to destroy a limited but valuable food product—the annual catch under present restrictive laws, aided by artificial propagation, being barely sufficient to maintain a reasonable annual supply;

Resolved, That the taking of nongame fishes, under proper supervision, be encouraged in every legitimate manner consistent with the preservation of a sufficient breeding stock to insure a future normal crop (in states where required, necessary legislation to this end should be enacted); that many waters in which the so-called game fishes predominate contain also rough fish such as carp, suckers, bowfin, gars, etc., and in such waters the removal of these nongame fishes will be beneficial to angling, and a limited amount of commercial fishing, under proper regulation, should be encouraged;

Resolved, That the anadromous fishes should be permitted to ascend the rivers from the ocean in sufficient numbers to maintain a constant and normal supply, and that to this extent the commercial fishing should be subject to proper regulation; and be it

Resolved, That a solution of this problem relating to the alarming decrease of these species rests in the federal control of all anadromous fishes; and be it further

Resolved, That a copy of these resolutions be forwarded to the Bureau of Fisheries, the United States Food Administration, and the fisheries authorities of the various states.

(Signed) JOHN W. TITCOMB,
Chairman.

GAME CONDITIONS IN ALPINE COUNTY.

Hunting and fishing in Alpine County was exceptionally good this year. Not for fifteen years has there been such an abundance of game in that district as there was this season. I obtained my limit of deer during the first two days—all mule-tail deer and every one a big fellow. This abundance of game is undoubtedly due to the spike-buck law, which is one of the best laws ever put into effect. Mountain quail and grouse seem to be double the number that they have been in previous years, and this is perhaps due to the lack of hunters on account of the war.

At Highland Lakes, the largest one being the headwater of the Mokelumne River and the smaller one the headwater of the Stanislaus River, the fishing is unequalled. Cutthroat, Loch Leven and Dolly Varden trout from 1½ to 5 pounds are numerous.

Fig. 109. A good day's kill. 3 wildcats and 1 mountain lion, made by Jay C. Bruce, February 14, 1918, at Wawona, California. This kill represented $53 in cash in addition to the sport.

The outlet to the large lake is the spawning grounds for the cutthroats, but this summer it dried up, leaving the spawn in little pools. Several other fellows and myself caught about fifteen horse buckets full and distributed them in the lake and farther on down the stream, to save them from dying.

ASA M. CLARK.

FINE FOR KILLING PIGEONS.

The fact that a great many pigeons of the racing homer type, which have been trained by the Signal Corps of the Army for purposes of communication, are destroyed by hunters and children, has led to the passage of an act by Congress prohibiting the killing or capture of these birds and providing a fine of $100 and imprisonment. Carrier pigeons are an effective means of communication in the Army, and any pigeon in the air may therefore be "in the service." Consequently it is necessary that they be allowed to proceed on their way unmolested, for interference with them may prevent the delivery of an important message, or at least interrupt their training. The Fish and Game Commission has recently, through its deputies, given publicity to the above facts, and it is expected that the cooperation of hunters thus induced will insure greater safety to the birds.

FISH LAWS AGAIN MODIFIED.

The United States Food Administration has made the following modifications in the state fish laws, and these are now in effect:

Black bass, crappie, Sacramento perch and sunfish may be taken with hook and line in the state of California during the month of April. Otherwise the daily limit and prohibition of sale shall remain as in the present state law.

Market fish may be taken in Tulare Lake with nets under the supervision of the Fish and Game Commission.

Three-mesh or trammel nets or nets with strings or suspenders, provided the nets are not of less than five and one-half inch mesh, may be used in that part of Fish and Game District No. 12 B, lying northeasterly above Vallejo Light.

Shrimp trawls may be used for the purpose of taking shrimps only in the waters designated in the state laws as Fish and Game District No. 12, but any person or firm desiring to use a shrimp trawl must first notify the Fish and Game Commission of his intention so to do. Unmarketable shrimps taken while fishing for the fresh shrimp market may be dried and sold for food within the state of California. In the catching of shrimps, the line dividing what are designated as Fish and Game District No. 12 and No. 13 shall be considered as extending from Point Avisadero to the end of the Alameda Mole.

Gill nets may be used for catching smelt and herring in Elkhorn Slough, Monterey County.

California whiting, also known as corbina or surf fish, yellow-fin croaker, and spot-fin croaker, the sale of which is now prohibited by the state law, may, until further notice, be sold.

Paranzella nets, trawls or drag-nets shall not be used or dragged within the three-mile limit of District No. 19, under penalty of having the federal license revoked. It will be lawful to carry paranzella nets, trawls or drag-nets across the waters of the three-mile limit within District No. 19.

Bait nets may be used in Fish and Game District No. 20 (Santa Catalina Island) for the purpose of taking bait only.

Salt-water perch south of Point Concepcion, when caught incident to catching other fish, may be shipped and sold.

Beach seining is unlawful, except for seining for smelt in District No. 19 during the open season for smelt; *i. e.*, the first day of September to the thirty-first day of January.

Halibut below the four-pound minimum weight prescribed by the state law, may hereafter be sold, provided they are caught in conformity with the laws of this state as modified above.

Barracuda between eighteen inches in length and three pounds in weight, caught incident to catching other fish, may be sold.

FISH PROTECTIVE ASSOCIATION FORMED.

At the annual meeting of The Salt Water Fish Protective Association of Southern California, held in the city hall, Avalon, California, in June, 1918, the following officers were duly elected by unanimous vote: President, J. H. Stamford; First Vice President, James L. Trout; Second Vice President, B. Wynns; Secretary, Ernest Windle; Treasurer, F. W. Elder, with the following members to make up the Executive Committee: C. B. Parker, P. V. Reyes, H. D. MacRae. A motion was duly made and carried to make the membership dues of the association for the coming year as follows: Associate members $1, Active $2, Life $10, Benefactor $100. The association adopted for its 1918 motto, "For the improvement of conditions affecting spawning fish."

GAME SANCTUARIES IN PENNSYLVANIA.

The game preserves in Pennsylvania are each one about nine miles in circumference and inclose about 3,200 acres each. A tract of this size is large enough to provide safety for the game and not too large to permit animals to breed and live and die in them without benefiting anyone. They are surrounded by an open space from ten to fifteen feet in width, from which the underbrush has been cut. This is known as a fire-line, because forest fires can easily be extinguished by going along this line. On the inner side of the fire-line is stretched, about waist high, a strand of wire as thick as a telegraph wire, to mark the boundaries of this fixed area, and to give notice that it is more than an ordinary tract of land.

Along the wire at intervals of a hundred yards or so are posted notices, printed on cloth, calling attention to the fact that the wire encloses a state game preserve, upon which no hunting by any person is permitted at any time, and asking those who read to keep out and help to keep others out. Game is not enclosed, but comes and goes at pleasure. No dog is permitted on these lands at any time.

Each preserve is under the supervision of a keeper, who lives in a house erected for his use. He has a stable, a horse, and suitable fire apparatus. During the open season he travels around the sanctuary at least once each day. During the closed season he goes around as necessity may require.

It is the duty of this keeper to protect and feed game in the preserve, to kill vermin, and to see to it that any animal mortally wounded by hunters during the open season is captured and delivered to the men who first wounded the animal. The hunter, following his wounded quarry, finding it has gone under the wire, immediately reports that fact to the keeper, who, if he finds the game mortally hurt, kills it and delivers it to the hunter to whom it belongs.

Fig. 110. Bear Lake Hatchery, San Bernardino Mountains. This hatchery furnishes fish for [illegible] the most famous of the fishing grounds in southern California. Photograph by Barry, Ajusi, [illegible].

AEROPLANE OBSERVATIONS OF MIGRATING BIRDS.

Despite the strenuous and engrossing character of their occupation, a few aviators have found opportunity to note the height of flight of various migrating birds.

Thus, from French soldiers of the air, it is learned that swallows have been observed to maintain an average altitude of 700 yards and wild ducks one of 1,800 yards, while green plover have been seen at a height of 2,150 yards. Incidentally it may be mentioned that the ducks were moving at a speed of 65½ miles an hour when flying upward and 69 miles an hour when flying horizontally. From another aviator it is learned that when he was flying at 9,500 feet he saw swallows high above him. And another, whose observations were made at a height of 6,000 feet during a heavy bombardment, "with anti-aircraft shells bursting in all directions," states that he observed 200 golden plover, perhaps driven higher than usual by the fact that the vicinity was "an unpleasant belt to cross."—Current Items of Interest, Feb. 21, 1918.

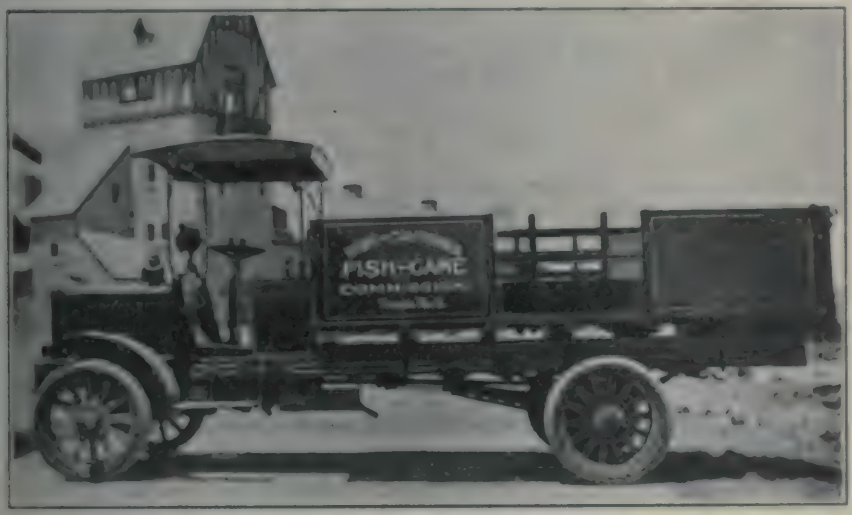


Fig 111. Truck No. 2 at Mt. Whitney Hatchery. By means of two trucks such as this the output of the Mt. Whitney Hatchery is hauled to the railroad station. Photograph by A. E. Culver, 1918.

THREE ESSENTIALS IN BIG GAME CONSERVATION.

In a program for rehabilitating the game resources of the National Forests, where there is abundant room for an enormous number of game animals without seriously interfering with the present livestock industry, three things are essential:

(1) A series of national game preserves located in favorable situations and distributed in National Forests throughout the West in order to provide breeding sanctuaries where game may increase and supply the surrounding areas.

(2) Co-operation between the Forest Service and the states wherein National Forests are located, whereby the Forest Service shall designate the parts of the forests where hunting may be done and the number of animals that may be killed in any particular forest or section of forest each season, the states meanwhile to have full control over issuing hunting licenses and to receive all fees therefrom. The states would thus benefit by the services of the trained force of forest rangers and guardians acting as federal game wardens to guard the game resources from spoliation just as they now protect the trees and the grazing in the interest of the country at large.

(3) A co-operative arrangement between the Forest Service and the National Park Service whereby the game service in the National Parks and the National Monuments shall be co-ordinated with that of the Forest Service to the same end, that the game supply may be increased and perpetuated.—E. W. Nelson, in *Recreation*, November, 1917.

DISTRIBUTION OF GAME BIRDS IN GERMANY.

According to present food regulations in Germany, a small number of the game birds killed by hunters go to the owners of the preserves on which they are taken, and the rest of the bag is divided into two equal parts, one for the local supply, the other for the cities. In Bavaria, four out of every five of all pheasants and partridges killed after the first five, must be delivered to the commune. Maximum prices are fixed for partridges and wild ducks. No report has come to hand of any relaxation of the laws protecting nongame birds so as to permit their utilization as food.—Current Items of Interest, June 29, 1918.

FACTS OF CURRENT INTEREST.

The Gates and the Harvester ranches near Corcoran, Kings County, which reported heavy damage by geese in February now report the heaviest grain crop ever harvested in the vicinity.

Large catches of salmon were made on the Sacramento River during the middle of September.

Catalina anglers had taken 600 tuna and 19 marlin-spike fish up to August 27, 1918. The deep sea angling of Santa Catalina Island attracts sportsmen from all over the world.

The tuna catch in southern California has been much below normal. The last of August the fish disappeared entirely and canneries had to turn their attention to yellowtail and other fish.

By September 5, sixty-one sportsmen of Sacramento had returned with deer. About ten of this number had secured the limit.

Some aliens are enthusiastic anglers. A Japanese in Sacramento recently sold twelve books of anglers' licenses to his countrymen.

Experiments have proved conclusively that ducks can be successfully frightened from rice fields by bombs.

The new federal regulations providing for the opening of the dove season on September 1 disturbed many dove hunters in District 1, where the season opened August 1, but many young birds will be spared as a result.

The drying up of many overflowed areas and many irrigation canals has necessitated the rescue of many fish in the Sacramento and San Joaquin valleys.

COMMERCIAL FISHERY NOTES.

N. B. Scofield, Editor.

INSHORE TRAWL FISHING NOT TO BE ALLOWED.

Recently fishermen operating the smaller seine trawls in Scotland asked the Fisheries Board for the privilege of fishing within the restricted districts within the three-mile limit. As far as we can learn this privilege has not been granted. The seine trawls of Scotland are a relic of the days when all of the fishing was done in shallow water close to shore, before the adoption of the beam trawl and later of the otter trawl.

Extensive investigations by the Scotland Fisheries Board into the effects of trawl net fishing resulted in prohibiting the use of these nets in shallow water within the three-mile limit, for the reason that the young fish congregate in the shallow water near the shore and their destruction and consequent waste by the operation of these nets was too great. Despite the fact that many of the varieties of fish in the North Sea have been depleted and the larger trawlers now go as far as Iceland for their fish, and despite the fact that Scotland and England have been engaged actively in the Great War for four years and meats have become scarce, and the price paid fishermen for trawl-caught fish has reached the government's maximum control price of 18 cents per pound, the trawls are still prohibited from fishing in the water near shore. England and Scotland in conserving their fisheries plan to regulate the fishing so that they will get the greatest perpetual output and they will not consent to the excessive destruction of fish before they have reached maturity. The destruction of young fish is bad enough in the deeper water and the trawls will not be allowed in the shallow water except as a last resort.

In California our trawl fishing is done in the most part by the primitive seine trawl, or paranzella, as it is called in northern California, and the drag-net, as it is known in southern California. For six years now these nets have been barred from the inshore districts within the three-mile limit along portions of the coast for the reason that here, as in the North Sea, they destroy too many immature fish close inshore.

Let us compare the conditions here with those in England and Scotland. Outside the three-mile limit in the neighborhood of San Francisco trawler fish are more numerous on each acre of bottom than they are in the waters surrounding England and Scotland. We have been at war little over a year and there is not a shortage of meat in California. We have an abundance of good varieties of fish, which, for lack of a market, are not caught. We utilize less than 10 per cent of the fish that are caught, the rest being canned or cured for export. No shortage in fish is indicated by prices, for the retail price of trawler fish here is only about half the price received by the fishermen in England. If we knew the retail price of these fish in England the price of our fish would appear ridiculously small. As stated above, England and Scotland have not deemed it necessary to set aside their conservation measures. We are different in America. We exploit our natural resources as though they were without limit, using destructive methods and taking little thought of the future.

Trawler fish during most of the year in California are caught in excess of the demand and large quantities are disposed of at reduction plants. Occasionally there are times when our primitive trawlers fail to make good catches for the reason that they actually fish only three hours out of twenty-four. On account of their lack of room aboard to clean and ice the fish or to house the crew they venture only a little way from port and have to return each evening. They also are unable to fish in deeper water than sixty fathoms. In spite of their poor equipment and their three hours of actual fishing a day, they manage to catch more fish during most of the year than the people will eat. Without proper facilities for caring for the fish they catch, or for holding their big catches over to dispose of during the time of poor catches, they occasionally fail to supply the market. Then the cry immediately goes up

that the restrictive laws are to blame and that they should be allowed to work inshore in the shallow water, even using the worn-out argument that they destroy fewer small fish in the shallow than in the deep water, never seeming to realize that their poor methods and poor equipment are to blame.

TINKER MACKEREL.

Excerpt from the New York Fishing Gazette of August 17, 1918:

"Probably the highest price ever paid for tinker mackerel at Portland, Me., was that given boat fishermen recently by the Rundlett Company, they paying 27 cents a pound right out of the boats. For the past two weeks mackerel have been unusually scarce all along the New England coast, few being found by the seiners, while the traps on the Maine coast have of late collected only small amounts."

This item should be of interest to Californians, for we have large numbers of tinker mackerel in our coast waters from Monterey to San Diego. Ours is in every way as good as the Atlantic fish, but is neglected at 10 cents per pound retail and the price to the fishermen seldom exceeds three cents. Not long ago there was what was styled a "fish famine" in southern California at a time when great schools of these excellent fish were all along the coast feeding close to the shore where anyone could catch them. When fishermen were asked why they did not catch them they replied that there was no market for them.

SCOTLAND'S FISHERY PRODUCTS.

The Annual Report of the Fishery Board of Scotland, recently published, states that the total quantity of fish, including shellfish, landed in Scotland in 1917 was 344,934,016 pounds, valued at $18,029,355. This is a decrease of 10 per cent compared with 1916, but an increase in value of 16 per cent; 4,609 fishing vessels were employed, manned by crews numbering 14,800.

ENGLISH FISHERMEN GET HIGH PRICES.

Steam trawlers in the northeastern fishing district of England landed at Grimsby and Hull, for the quarter ending June 30, 1918, a little less than 65,000,000 pounds of wet fish, which was worth to the fishermen 18 cents per pound. This is an increase over the corresponding quarter in 1917 both in quantity and price paid. The fish sold at the maximum government control prices. Other trawlers several times realized over $14,000 per trip and in one instance one trawler sold its catch for a single trip for $53,044.

CANADA EXPORTS NINETY-FIVE PER CENT OF CATCH.

According to a statement issued by the Canadian Government, the Canadians do not eat enough fish. Out of 200,000,000 pounds of cod caught each year, the people of Canada eat less than 5 per cent, the rest being cured for export. The government is making great efforts to induce the people to use more fish, as they are short of meats.

SOCKEYE SALMON RUN BEING RE-ESTABLISHED IN THE COLUMBIA RIVER.

Years ago there was a good run of sockeye salmon in the Columbia River, but due to excessive fishing on the lower river and to the use of traps and spears for capturing the fish after they had reached their spawning grounds in the upper tributaries, the run was all but wiped out. In fact, the run was so depleted that a sufficient number could at no place be taken to warrant establishing a hatchery.

Eight years ago the U. S. Bureau of Fisheries conceived the idea of bringing sockeye eggs from their Yes Bay station in Alaska to be hatched and liberated in the Columbia. The eggs were sent to the Oregon Fish and Game Commission and hatched at the State Hatchery at Bonneville. Unfortunately, the young fish were not held a sufficiently long time after hatching and it is doubtful if any result was obtained during the first few years of the operations.

In the meantime, it was shown by the researches of Dr. C. H. Gilbert of Stanford University, that the young sockeyes naturally spend from one to three of the first years of their life in the lakes and that of the small proportion that pass to sea shortly after hatching, few or none live to return again to the stream. Four years

age, acting on this knowledge, several hundred thousand out of nearly two million young fish hatched, were retained and fed in one of the ponds at Bonneville Hatchery until the spring of 1916, at which time they were a little over one year of age. Under the direction of Dr. C. H. Gilbert fifty thousand of these sockeyes were marked by removing the adipose and both ventral fins. The marked fish as well as the rest which had been held in the pond were liberated in the spring of 1916.

The majority of the Yes Bay sockeyes mature in their fifth year, but a slightly smaller number mature and return to their parent stream in their fourth year. As these marked salmon were four years old this year a lookout was kept for their return with the result that numerous marked fish have been found from Astoria to The Dalles. As high as ten specimens were received at one cannery in a day. As is usual in such cases, all of the salmon receiving stations did not look carefully for the marked fish or keep a proper record of those which were observed, but from the number of marked fish observed by certain canneries it is estimated that fully 2,000 marked fish were taken on the river, which is 4 per cent of the number marked. This is a conservative estimate of the number of marked fish which were captured and does not take into account the marked fish which returned, but were not captured.

It is also pointed out that more marked fish can be expected to return next year for a majority of the Yes Bay sockeyes mature at five years and a large proportion of the native Columbia sockeyes mature at five years.

An interesting and very important fact in connection with this experiment is that these Yes Bay salmon averaged 6½ pounds weight while the Columbia sockeyes, or "Bluebacks" as they are called, average about 3½ pounds, thus indicating that by properly selecting the breeding stock much larger fish can be produced in the same length of time, greatly increasing the output of the river without correspondingly increasing the expense of the hatchery operations.

But, of far greater importance is the large per cent of returned marked fish, good evidence which so far has been lacking, that intelligent artificial propagation of sockeye salmon pays. If in nature one sockeye egg out of each thousand would hatch and the resulting fish reach maturity, and return to the parent stream to spawn, the run would hold its own even if one-half the returning fish were captured by fishermen.

Bearing this in mind, the gain of getting back 4 per cent, or 40 out of each 1,000 of the fish, becomes more apparent.

LIFE HISTORY NOTES.

RING-NECKED PHEASANTS IN SANTA CLARA COUNTY.

Ring-necked pheasants (*Phasianus torquatus*) have been doing well in the Santa Clara Valley, especially so on the freshwater marshes or lowlands. However, the fact that alfalfa fields, and the fields in which volunteer hay is raised, form favorite nesting places constitutes a serious menace to the birds, for large numbers of eggs and young are destroyed by mowing machines. The birds are laying and nesting just about the time hay is being mowed. The hen sits very close and does not leave or fly from the nest until the mowing machine is right on top of her, very often too late to save the eggs or young chicks, and quite frequently too late to save herself from being killed.

Last season in the Ogier field, containing about 100 acres, while the first crop of alfalfa hay was being cut, over 100 eggs, about 25 young pheasants and three pheasant hens were destroyed and killed. In the Billings field on the Coffin Road, near the Mountain View Road, four nests containing about 60 eggs and one hatch of about 14 young birds were saved. During this season (1918), on this place, not one egg or bird was lost; but last season not a single one was saved, although Mr. Johnson, who drove the mower both seasons, kept watch as best he could and made every effort not to run into or over a nest. In the Cooney,

McAbbee and Gripenstraw fields on Downer avenue, near the Almaden road, about one-half the eggs were saved, and most of these were taken to the State Game Farm. On the H. W. McComas ranch, between Agnew and Sunnyvale, there is a pear orchard of about twelve acres upon which the grass and weeds were allowed to grow quite high, and when being plowed under last April fifteen pheasant nests were turned over. Only nine eggs were saved out of all these nests.

When the hay is cut over or even around nests the pheasant hen seldom returns. Occasionally she does come back to her nest and finishes her hatch.

Pheasants in the wild state commence nesting a little earlier than those in captivity; sometimes even hatching in the winter. Last February on the Nicholson ranch, near Alviso, I saw four little pheasants a little over one-fourth grown, and on the Fisher ranch, near Coyote, a brood of about a dozen just able to fly. Of course, these must have been exceptionally early hatches.—I. L. KOPPEL.

VALLEY QUAIL SUCCESSFULLY REARED.

In the hope that the following facts regarding the breeding of valley quail may be of service to other breeders, we here detail our experiences. Three years ago there came into our possession a pair of valley quail. The female was a very young bird and was raised by hand. These birds were kept in an aviary along with many other small finches. The first year the female deposited 22 eggs, but would not incubate them; later the same year she laid 15 more and these she also deserted. The second year the first clutch contained about 18 eggs, but these were deserted: The second set was carefully incubated by the male bird, the female showing no inclination to sit on the eggs. Not a single egg hatched, however. This year, 1918, 18 eggs were deposited and the female began incubating the first part of May. Twenty-three days later she came off the nest with 16 young. One of the chicks was found dead the first morning, and several others died soon after, probably owing to the fact that the male would not hover the young at night and the female could not cover so many growing birds. Nine were brought to maturity. Of this number eight are males. Another time we believe that greater success can be attained. The young quail were fed on dry weevils, and later on weed seeds, obtained as screenings from threshing machines.—H. C. BRYANT.

A DEER TRAGEDY.

The accompanying picture (Fig. 112) illustrates one of the tragedies of the woods. Notice the foot of the deer which is wedged in the fork of the oak tree. After following the trail of a coyote, I found the carcass of this deer, upon which it had been feeding. The vegetable matter on the ground having been covered by two feet of snow, the deer had put his front feet up on the trunk of the tree to reach some mistletoe on which he intended to feed. One foot slipped and caught between the forks of the tree. As the animal struggled to free himself the foot became more tightly wedged and the deer must finally have become frantic, for his leg was twisted up to the shoulder and he was lying on his back, dead. The picture was taken this year (1918), two years after the accident.—JAY C. BRUCE.

YELLOW PERCH NEAR SACRAMENTO.

The occurrence of yellow perch near Sacramento makes the history of its introduction of interest. In November, 1908, I received from the United States Bureau of Fisheries, through the Fish and Game Commission, a large number of blue-gills, sunfish and crappie; also about forty fingerling yellow or ring perch (*Perca flavescens*). These were placed in suitable localities near Sacramento. However, this was not the first introduction of these fishes into California waters, for in 1891, 3,000 yellow perch were planted in the Feather River. In 1904 I was informed that owing to the low stage of water in Nigger Jack Slough, near Marysville, large numbers of yellow perch were dying. I proceeded there immediately and saw a number of this species of fish dead in the shallow waters. There were quite a number of patients from the Yuba County Hospital catching some with hook and line in the deeper waters of the slough, some of them of good size. I immediately reported the

matter to Mr. Charles A. Vogelsang, who was chief deputy of the Commission at that time, and he sent the late deputy Manuel Cross to assist in the removal of these stranded fish to permanent waters. The presence of these fish was doubtless the result of the Feather River planting. Conditions must have been highly favorable for them as there was a larger number of them in this body of water than I have seen in any other body of water in the valley. We removed several thousand small and adult fish to the Feather River.

Yellow perch occasionally can be found in small numbers in nearly all the interior dredger cuts and canals in the Sacramento and San Joaquin valleys, notably so in the railroad cut that runs parallel with the Sacramento Southern Railroad from Sacramento to Walnut Grove. Also in Washington Lake, Yolo County, where I planted those last received from the Bureau of Fisheries. A few of them are occasionally taken in fyke nets in the Sacramento River, but in no considerable numbers.

Fig. 112. Skeleton of deer which met untimely death by getting foot caught in crotch of tree. Photograph by J. C. Bruce.

Although these fish have a very wide distribution in the valley, they are in no wise numerous. It is my belief that our voracious fishes prefer them to most any other species for food because I have occasionally found the young in the stomachs of black and striped bass. There are two processed specimens in the Sacramento office of the Fish and Game Commission, about twelve ounces each in weight, taken from the dredger cut parallel with the Oakland, Antioch and Eastern Railroad, near Sacramento.

GEORGE NEALE.

CALIFORNIA FISHERY PRODUCTS—APRIL, MAY, JUNE, 1918.

Species or fish	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Solano, Yolo	Sacramento, San Joaquin	Tehama, Glenn, Colusa, Sutter	Alameda, Contra Costa	San Francisco	Santa Cruz	Monterey	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego	Totals	Marin
Albacore												262,966	200	44,240	344,826	
Anchovy			7,500					206,685		161,800		9,300		4,366	393,151	
Barracuda								400		8,897	3,895	1,048,400	9,312	408,816	1,469,820	29,200
Bonito												21,136	450	7,400	28,986	
Bocaccio			125					20,375	30,455	148,850					199,680	
Bluefish								71,656	398	20,747					92,801	
Chilipepper								158,708	32,550	1,810					193,118	
Carp				7,268	14,912	1,005	27,131	27,620				27,450			105,886	
Catfish		11,388		7,328	34,193	2,105	23,657								78,671	
Coalfish			19					245,492	3,593	40		2,918	500		251,570	
Croakers												27,700		7,700	35,400	
Cultus cod	1,055	12,170	2,308					45,502	61,110	29,056					150,201	
Dogfish								16,896		94		1,637		4,847	23,474	
Flounder	2,776		391	541			2,908	91,529	10,170	24,668		427	340	21	130,047	
Halibut	19,239	7,853	43					14,789	2,136	10,671	51,852	469,324	7,467	66,302	1,134,754	23,443
Hake			8					51,315	2,288	16		6,177		1,578	61,382	
Hardheads					891	114									305	
Herring	100		574					178							447	
Kingfish								15,089	26,315	50,502		50,000	150	6,500	227,156	
Mackerel										147,497		623,805	1,008	31,000	803,310	4,000
Mullet												1,247			2,447	
Pike				24	1,167	297	1,012								2,500	
Pampano								719	1,031	1,575	41	1,036			6,195	
Perch	1,911		14,268					4,420	2,580	950		4,506	800	520	31,755	
Rock bass															1,000	
Rockfish	36,571	9,046	231					134,703	185,326	37,540	38,891	201,715	1,804	108,724	1,764,456	60
Sole	146		42					1,049,879	781,147	83,864	51,887	8,997	5	145	1,975,965	
Salmon	1,945	161,421	32,490	249,760	64,850	35,071	435,221	424,852	161,933	2,207,774		1,445			3,680,087	
Smelt	1,978		1,944				196	64,977	5,248	46,891	12,240	28,700	170	4,045	165,749	
Sea bass (white)								492		806	1,891	203,905	600	30,357	238,451	7,400
Sea bass (black)											2,756	15,148	2,721	42,852	63,477	1,550
Sand dabs								412,000	209,792	23,123		7,476			652,407	
Surf fish	7,461														7,461	
Striped bass			802	92,769	42,033	4,389	241,671	69,314	16						454,495	

Totals	61,429	128,878	212,986	911,170	312,807	45,245	2,267,678	3,471,926	1,550,028	5,366,335	140,947	42,421,747	30,767	10,029,260	69,991,568	195,538
Crustaceans—																
Crab (dec.)	1,262							15,371	246	427					17,306	
Spiny lobster											630			18,557	19,187	288,439
Shrimp								204,485							204,485	
Isopods																
Molluscs—																
Mussel			42					1,850	850	231,155		18,561		514	276,055	
Cockleshell			10					3,046	477	7,111		35			10,685	
Clam (Pismo)											266,049				266,499	
Clam (mixed)			2,749								100	6,150			14,000	
Clam (softshell)		6,096	22,096				32,016								60,307	
Clam (mixed)	2,760	1,267	32,440				10,780	709			26	3,971			50,482	
Oyster (shell) &c			92,173					887,659							1,048,725	
Abalone	1,332	270								125,000	19,189				147,714	
Mussels	200		504				1,806	1,921		300	479	5,800	600	100	9,810	
Reptiles—																
Sea turtle														17,208	17,208	
Snake (sea)												385			385	

VIOLATIONS OF FISH AND GAME LAWS.

June 1, 1918, to September 1, 1918.

Offense	Number of arrests	Fines Imposed
Game.		
Hunting without license	16	$395 32
Failure to produce license on demand	1	10 00
Making false statement on application for license	1	25 00
Deer—close season—killing or possession	21	465 00
Female deer—spike bucks, fawns—killing or possession	23	1,218 32
Failure to retain portion of deer head bearing horns	1	
Illegal deer hides—possession	1	80 00
Cottontail and brush rabbits—close season—killing or possession	10	135 00
Quail—close season—killing or possession	9	258 32
Doves—close season—killing or possession	14	285 00
Ducks—close season—killing or possession	2	50 00
Sagehen—close season—killing or possession	3	65 00
Wild pigeon—close season—killing or possession	3	25 00
Wild pheasant—killing	1	25 00
Nongame birds—killing or possession	1	
Netting song birds	2	100 00
Trespassing Mount Tamalpais Game Refuge	1	
Total game violations	110	$3,136 96
Fish.		
Angling without license	17	$240 00
Making false statement on application for license	2	50 00
Refusing to exhibit game fish on demand	1	20 00
Fishing for profit without license	1	10 00
Fishing with nets in restricted district	2	200 00
Trout—close season—taking, possession, offering for sale—excess bag limit	2	45 00
Trout—shipping by parcel post	1	
Striped bass—close season—netting—shipping from state—excess bag limit	9	235 00
Shad—close season—netting	4	60 00
Abalones—undersize—taking or possession	7	170 00
Crabs—undersize—taking or possession	1	20 00
Clams—undersize—excess bag limit—taking, possession, shipping	10	235 00
Pollution	1	
Dynamiting fish	1	200 00
Total fish violations	59	$1,475 00
Grand total fish and game violations	169	$4,611 96

SEIZURES—FISH, GAME, AND ILLEGALLY USED FISHING APPARATUS.

June 1, 1918, to September 1, 1918.

Game.		
Cottontail and brush rabbits	7	
Quail	5	
Doves	9	
Ducks	3	
Wild pigeon	4	
Sagehens	11	
Deer meat	377	pounds
Coon hides	21	
Fish.		
Salmon	40	pounds
Shad	286	pounds
Trout	4	pounds
Striped bass	24	pounds
Abalones	46	
Clams	721	
Illegal nets, traps and fishing outfits	5	
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SHRIMP FISHERIES OF CALIFORNIA.

By N. B. SCOFIELD.

As the question of removing the restrictions on the Chinese shrimp or bag nets periodically arises at each session of the legislature, it is thought best to give a brief history of the shrimp fishery in the state and to describe the fishery as it has existed in the past in order that those who care to can learn of the great destruction to young fish and young shrimps by the Chinese method of fishing.

The only account of the earliest shrimp fishing operations in the state is supplied by Mr. A. Paladini, the venerable fish dealer of San Francisco. He came to San Francisco in 1869 and engaged in shrimp fishing. There were eight boats on San Francisco Bay engaged in this

business, each boat manned by white men. They easily caught enough shrimps to supply the demand, besides many flounders, sole, tomcod, etc., for the fresh fish market. Fish and shrimps were very plentiful in the bay at the time. The shrimps caught were the same species as now, but were much larger than those caught in later years during the intensive fishing by the Chinese. This later reduction of the larger and older shrimps as noted by Mr. Paladini is good evidence that the shrimps were being subjected to overfishing. The early fishing of the eight boats of Italian fishermen was carried on with small meshed seines, sixty feet long and eight feet deep, with a bag at the center. They used the nets in the deeper water of the bay for there the catch was freer of young fish and of the small unmarketable shrimps. The manner of fishing was to lay out the net, then anchor the boat down the tide and pull the net along the bottom toward the boat by means of lines, always pulling with the tide. The net was pulled directly into the boat. They would make from three to five hauls on each tide and they caught from fifty to seventy-five pounds of shrimps at a haul. This method of fishing was far less destructive to young fish than that employed later by the Chinese. They could fish in deeper water, where young fish and young shrimps were fewer, and unlike the Chinese nets which are set during the whole tide and kill practically all the young fish caught, they were in the water only a short time—less than one-half hour—and the small per cent of young fish caught were still alive and could be returned to the water. The shrimps thus caught were sold fresh at the Long Wharf. Little thought was then taken as to whether a method of fishing was destructive or not and there were few laws protecting fish, for it was thought that the supply of fish in the bay and rivers was inexhaustible. The Chinese had for some years been in the fishing business and with their destructive methods of fishing had already begun the extermination of the Sacramento perch and with their fiendish sturgeon lines had inaugurated a method of fishing that has resulted in the commercial extinction of that valuable fish which in the early days was here in apparently inexhaustible numbers.

In 1871 the Chinese began fishing for shrimps and introduced the destructive Chinese shrimp net. They made enormous catches with these fine meshed set nets and found it profitable to supply the markets with shrimps at one and one-half cents per pound. The original eight Italian shrimp boats were driven out of business and since that time shrimp fishing has been almost entirely carried on by Chinese. From the very start the Chinese dried the bulk of their catch for the Oriental export trade. The shrimp fishery quickly grew to large proportions and fishing was carried on at many places in San Francisco Bay and in Tomales Bay in Marin County.

The first printed account of the shrimp fishery is contained in Vol. II of "History and Methods of the Fisheries" by Goode, printed in 1885 by the United States Bureau of Fisheries. A more extensive investigation of the fishery was made by the author for the California Fish and Game Commission in 1897. A subsequent investigation was made by the author in 1910. There has always been serious objection to the Chinese method of catching shrimps, and much of the legislature's time has been taken up by listening to discussions between those who would

conserve the fisheries resources of San Francisco Bay and rivers on the one hand, and the interested defenders of the Chinese, on the other. Closed seasons were finally resorted to and the drying of shrimps was prohibited, without greatly reducing the destruction of young fish. At the 1909–1911 session of the legislature the use of Chinese shrimp nets was prohibited entirely. The shrimps had been so reduced in numbers that it was found unprofitable to catch them by the method formerly employed by the Italians. It was also found to be unprofitable to employ the shrimp trawl which was in successful use on Puget Sound. In 1915 the legislature removed the restriction against the Chinese net in South San Francisco Bay on the ground that in that part of the bay the destruction to young fish was much less than in the upper bay and for the further reason that in that part of the bay the kinds of fish destroyed did not include the young of herring, smelt, shad and striped bass as was the case in the upper bay. At the 1916–1917 session of the

Fig. 1. Chinese fishing fishing junk on San Francisco Bay. Photograph by H. B. Nickerson.

legislature a very strong effort was made to reestablish the fishery in the upper bay by those who would be benefited in the way of rents, selling of supplies, etc., and by those who would have the picturesque industry for sentimental reasons. As this effort is sure to be renewed at the 1918–1919 session it is believed an intimate description of the industry as it existed up to the year 1910 will be of interest, especially as the Chinese now operating in South San Francisco Bay are using identically the same methods, with the single exception that they do not catch so many young fish in that part of the bay and the young fish caught are not of the more valuable species.

Camps. The fishing has been carried on by what has been termed "camps." Each of these camps is a separate unit, which has its own boat, wharf, boiling vat and drying ground, separate living quarters and storehouses. Although one Chinese company may have owned or controlled several camps, even side by side at the water's edge, they

and not co-operate in any way. The camps were very similar in character, consisting of a group of small, rude shacks of rough, unpainted boards, placed near the edge of the water, with a rough wooden wharf running out into the shallow water on hand-driven piling which answered as a landing place for the camp's junk. Very few of the camps could be approached at low tide, for which reason they usually fished the flood tide in order that they might more easily bring their catch to the landing. The shacks which constituted the living quarters and storehouses were, in the majority of cases, crowded on a narrow beach between the water and the hills. The dry grounds of each camp covered about an acre of the slope of the hills for the want of a better

Fig. 2. Scenes on board Chinese shrimp junk on San Francisco Bay. Photographs by H. E. Nidever.

place, and were usually floored with boards. In two or three of the camps the drying ground was partly on a platform built out over the water. In 1897 there were 26 camps operating on San Francisco Bay and in 1910 this number had been reduced to 19. The camps on Tomales Bay were abandoned some years prior to 1897. Of the 19 camps found in 1910 three were in the cove just above South San Francisco, five were at Hunter's Point, four in Contra Costa County south of Point San Pablo in Marin County. The three camps near South San Francisco were controlled by one company, the Fook On Lung Company of San Francisco. They furnished no fresh shrimps for the market but dried their entire catch. Their fishing ground was in Alameda County about three miles east of San Bruno Point. Each

of their three junks used sixty Chinese shrimp nets such as are described under "Methods of Operating Nets." Two of the five Hunter's Point camps, located on the south side of the point, were owned by the Quong Lee Chong Company of San Francisco. Each of the two boats fished forty nets and they dried their entire catch. Their fishing ground was about a mile off shore, a little west of south from the point, which brought them within San Francisco County. Of the three camps on the north side of the point, the two camps nearest the point were controlled by the Fook On Lung Company, also known as the California Shrimp Company. The third camp on the north side of the point belonged to the Union Shrimp Company, a Chinese company of San Francisco. The three last named camps sent part of their catch to the fresh shrimp market and dried the rest. They fished in Alameda County a mile south of the Alameda mole. The four Red Rock camps were located in a cove on the Contra Costa shore about two miles to the south of Point San Pablo. These camps belonged to the Union Shrimp Company of San Francisco and their four boats fished just to the north of Red Rock in water from four to six fathoms deep. This depth is greater than that fished by any of the other boats and it was not possible for them, on account of the depth and tide, to use more than thirty nets to each boat. Part of their catch went to the fresh market but the main part was dried. Of the seven camps near Point San Pedro, Marin County, one was situated in the first cove to the south of the point near the rock quarry. It was an independent company drying most of its catch but selling a few to the Union Shrimp Company, for the fresh market. Their boat fished about one-half mile southwest of the point. The next camp to the north of the point belonged to the Union Shrimp Company. Its boat fished about one-half mile off shore and sometimes across the channel in Contra Costa County. This camp sent part of its catch to the fresh market but dried most of it. One-half mile further to the north was a Quong Lee Chong Company camp and next to it in the same cove a Quong Sing Lung Company camp, while just to the north in the next cove was a second camp of the Quong Sing Lung Company and next to this two other Quong Lee Chong camps. These last five outfits packed, dried their entire catch and their five boats operated sixty nets each. They fished far out on what is known as the "Petaluma Flats," the furthest boat fishing one-half mile due south of the outer Petaluma Creek Beacon, the other near but to the southwest. All five fished within the county of Marin.

The following description of the boats, nets and fishing methods applies to the industry today just as it does to the industry as it existed twenty years ago:

Boats. The boats used by these camps are of Chinese pattern and make. They vary in size, but the majority are about fifty feet long and twelve feet beam, with rounded bottoms without a keel, and with square sterns and rather blunt bows. They have one mast which carries a Chinese cleated sail. About fourteen feet of the stern is decked in and constitutes the living quarters of the crew. This compartment is entered through a small sliding hatch and there the five men of the crew cook their meals, eat and sleep. Just forward of this is the open shrimp locker, about twelve feet square, for holding the catch, and next forward is a locker of similar size for holding the nets

The remaining space forward is used for lines and gear. On the deck between the crew's quarters and the shrimp locker is a crude wooden windlass placed horizontally and with four wooden spokes projecting by which it is turned by the hands and feet of the operator. From the drum of this windlass a line passes forward through a notch in the elongated bow post of the boat. This windlass and line is used to lift the series of nets from their fishing position at the bottom of the bay. The boats are of sufficient size to carry sixty wet nets and ten to twelve tons of catch.

Nets. Each separate net is constructed in the shape of a funnel. They are usually thirty-two feet long, with the larger opening or mouth about eighteen feet in diameter, from which the net tapers to the narrow opening a foot and one-half in diameter at the end of the sack. This narrow or end end of the net is closed by a string which can be untied to remove the catch when the nets are pulled up. The nets are made in China from a very strong and durable twisted grass-like fibre. The net has a mesh of three and one-half inches near the mouth but the size rapidly diminishes toward the small end until the sack has meshes of one-half inch or less. This small meshed end of the net, which has to sustain the weight of the catch when the net is pulled from the water, is usually reinforced by a net of coarse twine placed around the outside. In making the webbing of these nets square knots are used instead of the usual knot used by fishermen the world over. The nets are dried and tanned about once a month and with care they will last a year. Their cost is about $25 Mexican in China. After paying freight and other charges and adding the hanging line around the larger opening they cost here about the same amount in gold.

Method of Operating Nets. Each junk operates a set of nets, thirty to sixty in number, which are set side by side at the bottom of the bay with their larger openings or mouths open to the current. The nets are held in place by a series of brails or spreaders—2x3 inch sticks of pine five feet long—each of which is held to a short stake driven in the bottom of the bay by a line from either end, of sufficient length to permit of the brails with the nets attached being lifted to the surface during the slack water between tides, without detaching them from the stake. The stakes to which the brails are attached are driven twenty-four feet apart across the current in the muddy bottom of the bay in a very ingenious manner. For driving these stakes a very long tapering pole is used with a four-inch iron pipe fitted on the larger end so that a hollow end of the pipe projects a couple of feet beyond the end of the pole. Selecting a stake with lines and brail attached, its head is inserted in the hollow end of the pipe where it fits loosely but is kept from falling out by holding on to the brail lines while the pole is held in the vertical position over the spot where it is to be driven. The pole with the stake in place is then lowered from the boat until the stake is pressed into the mud. The stake is then driven home by repeatedly lifting the pole a short distance and then lowering it forcibly. The stakes are driven twenty-four feet apart across the current so that each brail when it is in position with nets attached will stand vertically on the bottom in each space between the mouths of the nets. Attached in this way, the net mouths instead of being circular are now rectangular in shape, the opening being twenty-four feet across and about four and one-half feet

deep. To remove any uneven strain on the nets and to prevent their being carried away by the swift tide, a heavy anchor or stake is placed about fifty feet out from each end of the row of stakes and in line with them, from which runs a heavy line which is tied with a clove hitch to the center of each of the brails. By anchoring this heavy line in line with the stakes and sufficiently far out, the arrangement does not interfere with lifting the brails and nets to the surface of the water when the catch is to be removed just before the slack water at the end of the tide. Besides the heavy anchor line running from brail to brail, there is another and lighter one, the buoy line, which facilitates in lifting the nets. This line, when the nets are set in fishing position, extends from a floating buoy at one end of the string of nets to the first or end brail, to which it is tied by a bight about a foot from its top. From thence it runs to each brail in succession until the last brail at the end of the string of nets is reached, from whence it extends up to another buoy on the surface of the water. This buoy line is in place only when the nets are set. The nets are fastened to the brails

Fig. 3. Sorting and drying young fish obtained from shrimp nets, Point San Pedro, 1907. Shrimp fishing endangers the fisheries by destroying young fish. Photographs by N. B. Scofield.

and the buoy line is attached just after the turn of the tide before the current has become swift. The force of the current swings the series of nets down onto the bottom where they are held by the brail lines to the row of stakes, reinforced by the heavy anchor line. Here they are left during the entire tide, the time varying from four to eight hours, with their mouths open against the tide while the current carries the shrimps and young fish into them. With this manner of fastening the nets they can be used on either a flood or ebb tide.

When the nets are to be lifted at the end of the tide after the force of the current has slackened sufficiently, an end of the buoy line is taken at one of the buoys, passed through the notch in the bow post of the boat and thence carried back to the windlass, where it is reeled in by one man, thus bringing the first brail to the surface and lifting the net with it. The other members of the crew detach the net and the buoy line from the brail while the man at the windlass reels up the next brail. Thus the nets are detached in succession, the catch being emptied into the shrimp locker and the nets placed in the net locker. The

Chinese are very expert in handling the nets and work rapidly, each man with a particular duty to perform. The time in which the nets have to be lifted is limited usually to about half an hour. They can not begin sooner for the nets can not be lifted when the current is strong. If they are not gotten out before the tide turns the nets begin to swing the other way and they become tangled and the catch is lost. When tides are so strong that there is danger of carrying the nets away they reduce the current pressure by tying the upper edge of the nets farther down on the brails. If the tides are extremely swift they reduce the number of nets.

Shrimp Drying. After the nets are all lifted the junk sails back to the dock at its camp, where the catch is carried in baskets. Chinese

Fig. 4. Shrimp boiling vat, showing skimmers and rakes hanging on crude chimney. Point San Pedro, 1910. Photograph by N. B. Scofield.

style, to the boiling vat. This vat is about four by eight feet and eighteen inches deep, with wooden sides, the bottom being of sheetiron bent up around the sides. It is built in with bricks and mud and to heat the water both wood and coal is used. Fresh water to which rock salt has been added is used in the vats. The shrimps, together with the fish caught with them, are poured in, ten or twelve baskets at a time, and boiled from ten to fifteen minutes. They are then dipped out with a strainer and put into baskets to be carried to the drying ground. Here the shrimps and fish, the latter usually small and delicate with the flesh boiled from the bones, are spread out together to dry in the sun. When the weather is good the shrimps will dry in about four days, when they are gathered together and rolled with cleated, wooden rollers

to break the shells from the meats. The whole mass is then carried to a shed where it is run through a small fanning mill to separate the loose shells, fish bones and pulverized fish flesh from the heavier shrimp meats. By screening and hand picking the shrimp meats are divided into two grades, the unbroken meats in one and the broken meats in the other. They are then sacked, 280 pounds to the sack. The shells, fish bones and fish flesh, and all fine particles and dust are saved and put in sacks, 310 pounds to the sack, and sold for use as a fertilizer. The loss in drying is about 65 per cent, and for each pound of shrimp meats there are two pounds of fertilizer or "shells."

Drying Fish. The amount of young fish taken in the Chinese nets is always large, varying from 10 to 75 per cent of the entire catch. Formerly large quantities of these fish were dried. The larger fish were picked out and hung on strings to dry while the very small fish, principally the young smelt (*Osmerus thaleichthys*) were dried on trays which had been covered with discarded net webbing. The small fish were separated from the shrimps by dumping a basket of the catch in a small vat of cold water where the live shrimps sank to the bottom, thus allowing the small dead fish to be easily skimmed from the top. After being prosecuted for catching young fish they ceased to dry the small fish and boiled them with the shrimps to get rid of the evidence as quickly as possible. They were nearly as valuable as a fertilizer as they were as a food product. There has always been this incentive to catch the young fish and experience has shown that it is impossible to operate the Chinese net without catching great quantities of immature fish, thus causing great damage to the fisheries of the bay and rivers.

Fresh Shrimps. In the camps that sent fresh shrimps to the markets they had a special shed at the wharf where part of the catch was taken and the larger shrimps screened out by hand and all fish, seaweed and dirt carefully picked out. The shrimps for the market were boiled before the rest of the catch, in the same way as were those to be dried except that less salt was used and they were not boiled quite so long. After boiling, the shrimps were spread on matting on the sorting room floor where they could cool and the surplus moisture evaporate. They were then placed in baskets and conveyed by power launch to San Francisco.

Three Species of Shrimps. Three species of shrimps are taken in San Francisco Bay. Fully 90 per cent of them are of one species, *Crago franciscorum*. The remaining 10 per cent is made up of the two species, *Crago nigricauda* and *Crago nigrimaculata*.

The shrimps drift back and forth along the bottom of the bay with the tides but have the power in some measure to select their environment, for in the winter time when the fresh water is entering the bay in larger quantities they move farther down the bay. In the summer when the blue sea water encroaches on the flats they move farther up toward the river mouths. They appear to go on the shallower flats when they are carrying their eggs. The smaller individuals are found mostly in shallow water and in the deeper and swifter water more large ones are found. They have a wide range, however, for they are found in the deepest water as well as the shallowest and can be found in water perfectly fresh as well as in pure sea water. Very little is known about their life history. Females may be found carrying eggs attached to

her swimmerets at all seasons of the year. From evidence that has been gathered it is certain that the eggs are carried at least two months on the outside of the body before they hatch and the life of the shrimp from the egg through one spawning time is not less than two years. They feed on minute animal and plant life at the bottom. They may at times feed near the surface for they can swim rather rapidly through the water, moving with the head first.

Character and Quantity of the Catch. The catch of one junk for one tide varied from ten hundred pounds to ten tons. An average day's catch for the boats using forty nets was six thousand pounds and for the boats using sixty nets, eight thousand pounds. The nets always contain young fish, the quantity varying from 10 per cent to 75 per cent of the entire catch. The boats using sixty nets each on the shallow flats on the west side of San Pablo Bay caught the greatest proportion of young fish. The reason for this is that most of the fish which enter San Francisco Bay enter for the purpose of spawning. Among these fish the valuable ones are the herring, smelt, striped bass, shad and salmon. Besides these the young of other valuable commercial species, such as the crab and the sole, enter the bay for the purpose of feeding and for protection. A bay with rivers entering it is always a nursery for young fish. Where there is an intermingling of fresh and salt water as in the upper San Francisco Bay there is a prodigal growth of small animal life, including shrimps and other species of small crustaceans. Upon this small life the young fishes feed. The young fish are there because the shrimps are there. A method of shrimp fishing such as that employed by the Chinese, which catches the young fish as readily as the shrimps and holds them until they are suffocated, is a serious menace to the whole fishing industry of the bay and its tributary rivers. Even if they caught only shrimps, there is a limit to the number which should be caught for they are the food of our more valuable fishes, but when the method of fishing takes the young fish themselves in vast quantities, as did the Chinese nets in upper San Francisco Bay, it should not be tolerated if we value the other fisheries, or if we value the shrimp itself, for there is every evidence that even the shrimps were being overfished. To appreciate the seriousness of the situation as it existed in 1910, just imagine the nineteen Chinese junks with their combined nets numbering one thousand, each one having a mouth opening of 24x4½ feet, straining the small fish and shrimps from the rushing water, tide after tide. The total annual catch by the Chinese junks at the time they were stopped from fishing in 1911 was considerably in excess of ten million pounds of fresh shrimps and fish combined. Of this amount no more than eight hundred thousand pounds of the shrimps were used fresh. The rest was all dried and marketed as dried shrimp meat and fertilizer.

After the Chinese method of fishing was stopped it was found that the Italian method as employed in the early days was not profitable, for the shrimps were too scarce and there were no more flounders or tomcod. Neither was the shrimp beam trawl profitable for the shrimps were not plentiful enough for that method and the nets were torn on the Chinese shrimp stakes driven all over the bay. As no other method of catching shrimps was employed and as the market was bare of shrimps, the

presence of which had been for years a feature of California, the ban was lifted from the Chinese nets in southern San Francisco Bay in 1915. The nets do less damage in that part of the bay as there are fewer young fish there of valuable varieties for the reason that there is little fresh water flowing in that portion of the bay. The young of the herring are not found there, as they spawn in the upper bay, nor are the young of the smelt, shad, striped bass or salmon found there, for they are hatched only in the larger rivers and as they descend to the bay they distribute themselves in the brackish water nursery of the upper or San Pablo Bay. Shrimps were not very plentiful in south San Francisco Bay on account of the former heavy fishing and on account of the gradually increasing salinity of the water. Drying of shrimps had also been prohibited and it was found not very profitable to fish for the fresh market only. During the first year after they resumed fishing the markets took less than 350,000 pounds of shrimps. They could have had more but there was not the former demand. The amount of

Fig. 1. [illegible] Point San Pedro in 1913. Photographs by N. E. Scofield.

fresh shrimps marketed has increased each year until now the amount is equal to that of any former year when shrimp fishing was at its height. The shrimps have increased in numbers in all portions of the bays, as also have the number of small fish, especially the young of the striped bass. It has now become profitable to use the shrimp beam trawl which, towed with the tide, catches the shrimp with a very small per cent of young fish. As illustrative of the damage done by the Chinese nets in former years the following is quoted from my note book of 1897:

> The average catch per day for each boat at the San Rafael [Point San Pedro] fishery, during the last two weeks of July was seventy baskets, each basket weighing about ninety pounds, making in all six thousand three hundred pounds. The average number of boats out each day was seven, making in all a daily catch of forty-four thousand one hundred pounds. For thirteen days [the time they were under continual observation] this number is swelled

to six hundred sixty-one thousand five hundred pounds. One-half of this catch consisted of small fish, the principal species being smelt, California anchovy and sculpin.

The small smelt, two and one-half to three and one-half inches long, were very abundant, making up over one-fourth of the entire catch. The estimated amount of these young smelt taken in the last fifteen days of July is 165,375 pounds, or about 16,537,500 small fish. When the nets are brought to the surface of the water, these small smelt are dead, so that to throw them back would do no good."

Later, in the year 1910, we made the following notes:

"*Oct. 25, 1910*: Visited two San Pedro Point boats as they lifted their nets. One had 30 per cent of young fish, mostly smelt and sole. They also had a good many undersized female edible crabs, which were alive, but they had not attempted to throw them back. The other boat had 20 per cent of young fish.

Oct. 28, 1910: Six boats out of San Pedro Point. Ming's boat had eighty baskets on this tide, of which 30 per cent was fish, mostly young smelt, young sole, and tomcod. One boat had forty baskets, two boats fifty baskets each, and the remaining two had seventy-five each. The amount of young fish was about 20 per cent. Ming says he uses forty nets and has averaged seventy baskets a day for September and October. The five camps above him use sixty nets each and their catch is much larger.

Oct. 29, 1910: Again visited San Pedro Point boats. Five boats out. The catch the same as yesterday. Three boat crews have been arrested in the last few days for catching young fish, but when visited yesterday and today they made no attempt whatever to throw back even the few fish that were alive. Wing had used a screen to get out the fish, but his catch was still 30 per cent fish. Their nets were all set wide open, as the tides are not so strong now."

The above notes are selected to give a conservative idea of what the average catch consists in upper San Francisco Bay. The greatest damage is done on the shallow San Pablo Bay flats. During the winter months large numbers of small striped bass are killed in the nets. The boats which fished below San Pablo Bay in the deeper water near Red Rock and the Stone Quarry caught smaller quantities of young fish than those above, but they caught more of the young striped bass than any others. The late increase in the number of striped bass is undoubtedly in large part due to the abolition of the Chinese nets in the upper bay, and if we value that fine food and game fish the destructive shrimp nets should be kept out.

The Chinese operating in South San Francisco Bay catch fewer young fish and the varieties caught are not of the valuable species. The lower bay can easily supply the fresh markets without serious injury to any of the other fisheries. But even there, the nets should be prohibited as soon as a less destructive method of shrimp fishing can be developed.

THE FISHES OF THE CROAKER FAMILY (SCIAENIDAE) OF CALIFORNIA.

By EDWIN CHAPIN STARKS, Stanford University.

The fishes of this family have a peculiar silvery skin that is unlike the bright, burnished silver of some fishes, the herrings for instance, but suggests rather frosted silver. The head is closely covered with scales, more or less irregular in size and shape, and the pore-bearing scales of the lateral line extend onto the caudal fin. The bones of the skull are variously excavated with tunnels and open channels (cavernous), and the chin is usually provided with large pores or barbels. Two dorsal fins are present; the first composed of spines and more or less triangular in shape. The anal fin has one or two spines, sometimes very small and slender or sometimes the second one is very much enlarged.

The croakers are carnivorous fishes rather distantly related to the basses. Many of them make a peculiar noise from which the common names of croaker, grunter, and drum have been derived. The noise is supposed to be made by forcing the air (or more properly, gas) from one part of the swim bladder to another. The species are numerous on sandy shores, and are most abundant in warm and tropic seas. At Panama, for instance, there are between 40 and 45 representatives of this family. Of the eight that occur on our coast only two are found in abundance as far north as San Francisco. Most of the others occasionally stray that far, but are common only on the southern coast. All of them are very good food fishes, and some are classed as game fishes.

The common or popular names of these fishes are even more mixed up and poorly applied than usual. *Cynoscion nobilis*, the "sea bass," is not a bass, and *Seriphus*, sometimes called the herring, does not even remotely resemble the herring. The young "sea bass" is known as "sea trout." No possible stretch of the imagination could make it suggest a trout, and having wrongly called its parent a bass, to call it a trout is a very good commentary on how loosely common names are used. *Genyonemus*, the fish that is usually known as the kingfish, is sometimes called "tomcod" on the southern California coast. It resembles a tomcod as little as *Seriphus*, the queenfish, resembles a herring. When *Genyonemus*, the kingfish, is called "tomcod" the name kingfish is transferred to *Seriphus*, the queenfish, or white croaker. *Cynoscion parvipennis*, a close relative of the "sea bass," is sometimes called "bluefish," though it has nothing whatever in common with the famous bluefish of the Atlantic. The names croaker, roncador, and corvina are not at all consistently applied, but are shuffled back and forth between various of these fishes.

Hence in the use of vernacular names among these or any other fishes the reader is again cautioned that there is no constancy nor rule for their application, and he can only be sure of definitely indicating a given fish by using its scientific name. Though such names will probably never be used by people at large, and certainly not by unlettered fishermen, the scientific name is nevertheless the one true name for a species, and a name that will be recognized by scientific men in all countries the world over.

KEY TO THE FISHES OF THE CROAKER FAMILY IN CALIFORNIA.

1. Lower jaw projecting beyond tip of snout, which is sharp.

2. Base of second dorsal fin about equal in length to base of anal fin. ***Queenfish or White Croaker.*** ***Seriphus politus.*** Page 15.

2-2. Base of second dorsal fin very much longer than that of anal fin.

3. Teeth at middle of upper jaw little if any enlarged. Pectoral fin more than half the length of head. Its tip reaching about as far back as tips of ventrals. ***White Sea Bass.*** ***Cynoscion nobilis.*** Page 15.

3-3. One or two long teeth pointing backward at the middle of upper jaw. Pectoral fin less than half the length of head. Its tip not reaching as far back as tips of ventrals. ***California Blackfish.*** ***Cynoscion parvipinnis.*** Page 16.

1-1. Tip of snout blunt and projecting beyond tip of lower jaw.

4. A single short barbel or appendage at tip of lower jaw.

5. A large thick spine at front of anal fin. The first spine of the first dorsal not longer than the spines just behind it. The tip of the first dorsal rounded. ***Yellowfin Croaker.*** ***Umbrina roncador.*** Page 17.

5-5. No enlarged spine at front of anal fin. The first dorsal spine longer than the others, making the tip of the first dorsal very sharp. ***California Whiting.*** ***Menticirrhus undulatus.*** Page 17.

4-4. No single barbel at tip of lower jaw.

6. A large thick spine at front of anal fin.

7. A large black spot on front of pectoral fin. Pectoral fin as long as head, and reaching past tips of ventrals. Caudal fin concave behind. ***Spotfin Croaker.*** ***Roncador stearnsi.*** Page 18.

7-7. No spot at front of pectoral, but a dark spot usually present on hind edge of gill cover. Pectoral fin much shorter than head and not reaching to tips of ventrals. Caudal fin not concave behind. ***Black, or Chinese Croaker.*** ***Seriphus saturnus.*** Page 19.

6-6. No enlarged spine at front of anal fin. ***Kingfish.*** ***Genyonemus lineatus.*** Page 20.

GLOSSARY.

Anal fin: The single fin on the lower side of the body towards the tail.

Barbel: A small fleshy projection or appendix. In these fishes it is on the lower jaw.

Caudal fin: The tail fin.

Dorsal fin: The fin on the back. In these fishes it is divided into two fins: the first composed of spines, and hence called spinous dorsal; the second composed of soft rays.

Maxillary: The flattened bone bordering the mouth above.

Pectoral fin: The pair of fins, one on each side, situated close behind the gill opening.

Preopercalum: A bone of the gill cover that borders the cheek behind. It is considerably in front of the hind edge of the gill cover, and has a free edge.

Snout: The part of the head that lies in front of the eyes except the lower jaw.

Ventral fins: The paired fins on the lower part of the breast; close under the pectorals in these fishes.

The Queenfish, or White Croaker (Seriphus politus).

The length of the base of the second dorsal fin is about equal in length to the base of the anal fin. The tip of the snout is rather sharp and the tip of the lower jaw projects beyond it when the mouth is closed. The mouth is long and narrow, and the maxillary does not quite reach to vertically below the hind border of the eye. The dorsal fins are well separated, and the spines of the first dorsal are slender. The color is bluish above with the sides and belly bright silvery, the fins yellow, and the base of the pectoral dusky.

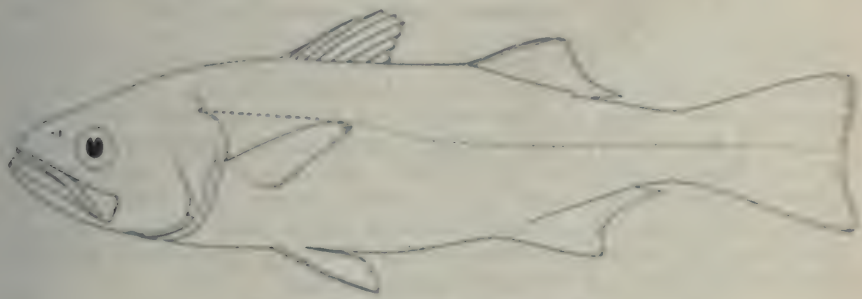

Fig. 6. The queenfish (*Seriphus politus*).

On the southern California coast this fish is ridiculously called herring, a name that should decidedly be discouraged, for it has nothing in common with the herring, is not related to it, and does not even look like it. It also in the same region shares with *Genyonemus lineatus*, the name of kingfish. The latter is almost universally so known and hence has the best right to the name.

This fish reaches a length of about a foot, and is an excellent pan-fish. It is salted and smoked to some extent in southern California and marketed as herring. It is common on sandy shores of the southern and Lower California coasts, and has been taken as far northward as San Francisco.

The White "Sea Bass" (Cynoscion nobilis).

The snout is sharp and the tip of the lower jaw projects beyond it when the mouth is closed, while the length of the base of the second dorsal is three or more times the length of the anal base. The length of the pectoral fin is more than half the length of the head, and the tip of the pectoral reaches about to opposite the tips of the ventrals. There are no greatly enlarged teeth pointing backwards at the front of the upper jaw. The mouth is large and the maxillary nearly or quite reaches to vertically below the hind border of the eye. The caudal fin

is concave behind. Very fine dark points are everywhere dusted over the silvery color, making it more or less dusky bluish. The inner surfaces of the pectoral and ventral fins are dusky.

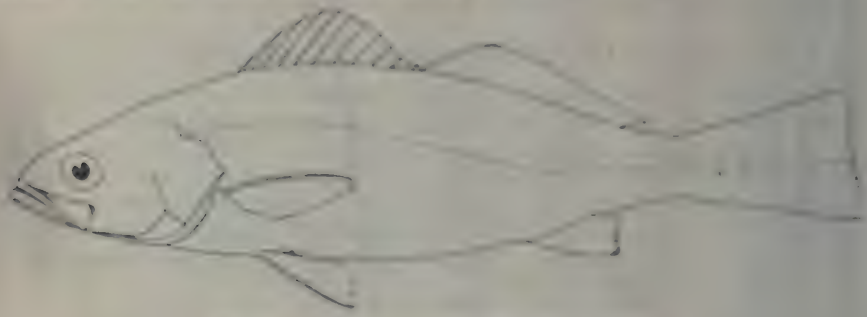

Fig. 7. The white sea bass (*Cynoscion nobilis*).

Though this fish is only distantly related to the bass, it is in California almost universally known as the sea bass or white sea bass. On the Atlantic coast fishes of this group are known as weakfishes. This species is one of our most valuable food fishes, reaching a weight of 90 or more pounds, and having firm white flesh. It is found in considerable abundance along the California coast and southward to Lower California. It has been reported as far north as Puget Sound. The young has dusky bands extending down from the back onto the sides. Fishermen call the small ones sea trout.

The California "Bluefish" (Cynoscion parvipinnis).

As in the white sea bass the snout is sharp; the tip of the lower jaw projects beyond it when the mouth is closed; and the base of the second dorsal fin is much longer than that of the anal fin. It may be known from the white sea bass by the pectoral fin being less than half the length

Fig. 8. The California Bluefish (*Cynoscion parvipinnis*).

of the head, and its tip not nearly reaching as far back as the tips of the ventrals. It is also distinguished by having one or two long sharp teeth pointing backwards from the middle of the upper jaw. The dorsal fins are close together. The color is steel blue above and silvery on the lower parts and sides.

This fish closely resembles the white sea bass—in fact it is not recognized as different by many fishermen. It does not reach as large a size,

probably not exceeding a couple of feet in length, and it is said to be much inferior to it. Its flesh is soft and it does not bear transportation well. It is found from southern California southward along the coast of Lower California.

The name bluefish as applied to this species probably is on account of its color, and not because it is thought to be the same as the famous bluefish of the Atlantic. The latter is a very different fish, not at all related to this species.

The Yellowfin Croaker (Umbrina roncador).

This fish may be known from its relatives by a short fleshy barbel, or appendage, that projects from the chin, and, in addition, by a large thick spine at the front of the anal fin. The enlarged spine is the second anal spine, there being a very short one in front of it. Its snout is blunt and projects over and above the tip of the lower jaw. The mouth is nearly horizontal, and the maxillary reaches to under the middle of the eye. The edge of the bone that bounds the cheek behind

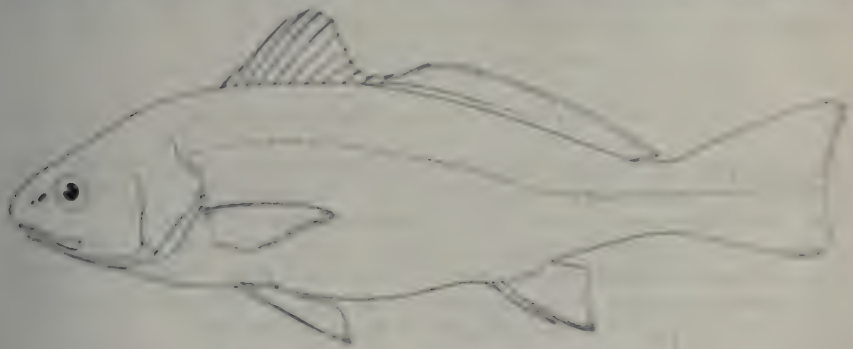

Fig. 9. The yellow fin croaker (*Umbrina roncador*).

(preoperculum) is set with fine spines. The spinous dorsal is triangular in shape but rounded at its upper angle at the points of the first spines. The pectorals are rather short and do not reach as far back as the ventrals do. The caudal is concave behind; and the upper lobe is longer than the lower. Brassy and golden reflections overlie the silvery color. The back is bluish, and over the back and sides are many wavy dark lines that extend upward and backward following the rows of scales. The fins are mostly yellow.

This fish reaches a length of 15 or 16 inches, and it is rather common on the southern California coast. Its range extends southward into the Gulf of California while an occasional one strays northward as far as San Francisco. It is a very good food fish, and is caught in considerable abundance by the anglers on the piers and beaches of southern California. It is a very handsome fish when it is first drawn from the water, but its iridescent colors soon fade.

The California Whiting or Corvina (Menticirrhus undulatus).

This is a well marked fish that may be known by a fleshy barbel, or appendage, that projects from the chin, the first dorsal spine longer than

the others, making the fin sharply pointed above, and the caudal fin with its lower angle rounded and its upper sharp. The barbel at the chin is longer than in the yellowfin croaker. It may be known from that species at once by its lacking an enlarged spine at the front of the anal. The upper jaw projects considerably over the lower, the mouth is horizontal, and the maxillary barely, or scarcely, reaches to below the front edge of the pupil. The edge of the preopercnlum is divided into fine points which are membranous and not bony spines as in the yellowfin croaker. The pectoral is rather long and reaches to about the tips of

Fig. 10. The California whiting (*Menticerrhus undulatus*).

the ventrals. The color is grayish with bright reflections. On the back and side are many dark wavy lines that run upwards and backwards. The back sometimes has faint dark bars crosswise to the body.

This fish is rather common on sandy shores of southern California, and is known southward into the Gulf of California, while individuals are sometimes taken as far northward as San Francisco. It is a very good food fish and reaches a length of 18 or 20 inches.

The Spot, or Spotfin Croaker (Roncador stearnsi).

This fish may be known at once by the large black spot at the base of the pectoral fin. It is not only on both sides of the pectoral, but is also somewhat on the body behind the pectoral base. As in most of the

Fig. 11. The spot (*Roncador stearnsi*).

croakers, a blunt snout extends over a horizontal mouth. The mouth is moderate in size, and the maxillary reaches to below the middle of the eye. The preopercnlum is set with fine sharp spines. The first dorsal has stout spines and the second spine of the anal is enlarged, the first spine being, as usual, small. The pectoral is as long as the head, and reaches considerably past the tips of the ventrals. The color is grayish silvery, lighter below. Wavy dark lines follow the rows of scales extending upwards and backwards. These are less conspicuous than in the yellowfin croaker. Two dusky streaks usually run back from the throat to the ventrals and thence to each side of the anal.

This fish is abundant on the southern California coast, and, like most of the others, has occasionally been taken as far north as San Francisco. It is of some importance as a food fish, and reaches a weight of 5 or 6 pounds.

The Black Croaker, or Chinese Croaker (Sciaena saturna).

The following combination of characters will identify this fish from its relatives: The snout blunt and projecting over the tip of the lower jaw; no barbel at the chin; the second anal spine large and thick; no

Fig. 12. The black croaker (*Sciaena saturna*).

black spot at base of pectoral; the pectoral shorter than the head and not reaching to the tips of the ventrals. The mouth is small, the lower jaw closes within the upper, and the maxillary reaches to below the middle of the eye. The scales on the head are small, rough and uneven. The preopercnlum has a membranous edge that is divided into very fine points which are scarcely noticeable without the aid of a magnifier. The dorsal spines are rather stout, but not nearly so stout as the second anal spine. The caudal is slightly convex, or with its middle rays the longest. The color is dusky with reddish coppery reflections. A pale band usually extends downward from between the dorsals to opposite the tips of the ventrals. This often fades with age. The lower parts are silvery but dusted over and obscured by dark specks. The side of the head is more brilliantly coppery color than elsewhere. The ventral fins are dusky or black. A black spot is present at the edge of the gill cover just above its angle.

This fish has not been reported north of Santa Barbara. Its range extends southward alonge the coast of Lower California. It reaches a length of about 15 inches, and is a fairly good food fish.

The Kingfish (Genyonemus lineatus).

The characters of the first sentence separate this fish from its relatives. The blunt snout projecting over the tip of the lower jaw; no barbel at the chin; no enlarged spine at the front of the anal. The mouth is rather oblique. The lower jaw closes within the upper, and the maxillary reaches to under the middle of the eye or a trifle farther. The edge of the preopercullum is membranous and without fine bony points. On each side of the lower jaw just behind the chin are several very small barbels, so small that they scarcely show without the aid of a magnifier. The spines of the dorsal are slender. The pectoral ends opposite to the very slender points of the ventrals, or reaches a little past. The caudal fin is slightly concave behind. Brassy reflections

Fig. 13. The kingfish (*Genyonemus lineatus*).

overlie the bright silvery color. Very faint wavy lines follow the rows of scales upwards and backwards. The fins are usually yellowish, and there is a small dark spot just behind the base of the upper pectoral rays.

This fish and the white sea bass are the only ones of this family that are found in any abundance as far north as San Francisco. It runs southward along the Lower California coast. It is commoner in summer than in winter, and more abundant on the southern coast than the northern. It scarcely exceeds a foot in length, but its abundance makes it a food fish of considerable importance. When fresh it is a very good food fish, but its flesh is rather soft and it does not keep very well. It is sometimes called tomcod in southern California. This name should not be used, for it in no way, shape, nor manner resembles the tomcod.

NOTE ON THE SAND DAB.

By EDWIN C. STARKS.

Through an oversight in the paper on flat-fishes that appeared in the last number of CALIFORNIA FISH AND GAME the old name of soft flounder was used as a common name of the fish that has in recent years been known as the sand dab (*Citharichthys sordidus*). This name, sand dab, has almost entirely supplanted the older name on our coast and for that reason should be used. It is, however, one of those unfortunate names borrowed from another fish from another part of the world. The sand dab of the Atlantic coast (*Hippoglossoides platessoides*) has the best right to the name, for it was first so called. It bears little resemblance to our sand dab. So in your copy of CALIFORNIA FISH AND GAME please write sand dab in place of soft flounder.

THE STICKLEBACK: A FISH EMINENTLY FITTED BY NATURE AS A MOSQUITO DESTROYER.

By CARL L. HUBBS.

Since it has been proved that malaria, yellow fever, and other dread diseases are carried by mosquitoes, there has developed a wide interest in these little insects, which hitherto had been regarded more as a nuisance than as a menace. Many studies have been undertaken in order to determine the best methods by which mosquitoes may be exterminated or at least greatly reduced in numbers.

The use of window screens, the draining of swamps, and the oiling of waters, as well as the spread of natural enemies, are methods of control that have received attention with very notable success. For instance, the building of the Panama Canal has been made possible by the destruction of mosquitoes and the consequent control of yellow fever.

A word as to the main methods of mosquito control. The use of screens does not eliminate the evil. The draining of swamps has been very successfully practiced in New Jersey, and is applicable to other regions where large, swampy tracts occur. The use of oil, which spreads as a film over the water, forms a sufficient control, but requires continued attention and expense, and can scarcely be applied to most ornamental ponds or reservoirs or to pools from which animals drink.

There is thus need for other methods, and of these the spread of the natural enemies of the mosquitoes is by far the most important. These natural enemies are numerous, and the most valuable of them all for the purpose are fishes, which destroy the young stages of the mosquitoes as well as the adults when they alight on the surface of the water.

Among the fishes extensively used in mosquito control, the little killifishes or topminnows may be mentioned, but there are others which can be strongly recommended. This short report is written to call further attention to the value of the stickleback (*Gasterosteus*) as a mosquito destroyer in California, particularly in the coastal regions.

FACTORS RENDERING THE STICKLEBACK AN EFFICIENT MOSQUITO DESTROYER.

1. *The stickleback uses mosquitoes as food.* This point is to be proved first of all. The evidence is convincing. The stickleback has been seen snapping up adult mosquitoes thrown into the water. Mosquitoes are unable to breed in waters inhabited by sticklebacks. This conclusion, previously arrived at in regard to the stickleback and the salt-marsh mosquito of San Francisco Bay, has been rigidly tested out in many of the streams from San Francisco south to the Mexican border. Only a few examples from the observations can be made here.

In San Francisquito Creek, near Palo Alto, pools were repeatedly found near one another and apparently similar except in this respect: in the one pool sticklebacks were plentiful, but no mosquito wrigglers could be detected, while in the other pool sticklebacks were absent, while mosquitoes were breeding in abundance.

The swamps, pools and streams of the coast region of San Luis Obispo and Santa Barbara counties appear as ideal breeding waters for mosquitoes, yet the people there enjoy unusual freedom from these pests and dangers. A study of the region makes it almost certain that these people have the stickleback to thank for the service thus rendered. But, even in these regions mosquitoes breed in abundance in the mountain canyons into which the sticklebacks can not penetrate because of the steep descent of the bouldery stream beds. The mosquitoes are forced back, however, into the mountains where there are fewer people for them to torment.

In Mission Valley in San Diego sticklebacks are, for some unknown reason, entirely absent, but mosquitoes and gnats are very troublesome during the summer months. From the valley the mosquitoes are blown up the canyons to the city on the mesa above. During the summer the surface waters of the San Diego River, which flows through Mission Valley, are reduced to a series of pools. In these pools three introduced fishes, the golden bream (*Notemigonus crysoleucus*), the bullhead (*Ameiurus nebulosus*), and the green sunfish (*Lepomis cyanellus*) are generally abundant. It seems that the stickleback is more efficient in the control of mosquitoes than are these three other fishes together.

During an entire summer's study of this problem, I never noted a considerable number of either mosquito wrigglers or sticklebacks in the same pool together. Wherever the stickleback can penetrate, and they go as far as they can, the mosquitoes are effectively destroyed.

2. *Abundance of other food will not deter the stickleback from feeding on the mosquito wrigglers.* This conclusion is evident from field observations, and is confirmed by the size and structure of the fish: its mouth, small even for such tiny fishes, will not permit it to feed on large insect larvæ such as those of dragon flies, which, by the way, upon emerging as the adult insect, feed upon the mosquitoes in the air.

3. *The stickleback feeds at all levels of the water, from bottom to surface.* Because of this fact, mosquito wrigglers of different habits are all picked up. Statements published by Seal, and by Lutz and Chambers for the stickleback of the East Coast, make it appear a bottom feeder. At least, such a conclusion does not apply to the stickleback of

California. I have thrown mosquitoes into a pool of the Los Angeles River, and scarcely would one of them drop below the surface before one of these little fishes would dart from some hidden corner and devour it.

4. *The habits of the stickleback render it destructive to mosquitoes.* This little fish hangs at any level of the water, tail bent to one side or the other, passively waiting for a stimulus to move. The wriggler is spied, and the stickleback snaps it up with pike-like speed and voracity.

5. *The stickleback itself is largely immune to the attacks of larger fishes.* This is a fact of much importance, giving the little spiny and armored stickleback a distinct advantage in many waters over other mosquito-eating fishes, as the topminnows. Sticklebacks live abundantly with rainbow trout, as in the Ventura River; and with black bass, as in the San Luis Creek. In ponds and reservoirs the waters could thus be stocked with both game fishes and sticklebacks, whereas the topminnows would, under such circumstances, soon be devoured.

6. *The stickleback is a widely distributed fish.* This little fish [*Gasterosteus aculeatus*], of several varieties, is found along the shores of all northern regions in the brackish waters of the bays and estuaries, and in the coastal streams. The stickleback in the streams of California extend their ranges from the estuaries as far up into the mountain canyons as they can penetrate. At high water they spread out and are trapped in many little pools from which mosquitoes are thus eliminated.

7. *The stickleback lives and breeds in small pools.* These pools include not only those along stream sides, but also the little shallow ponds and reservoirs about houses, which if not stocked with fishes, become breeding grounds for mosquitoes. For this purpose the stickleback is eminently fitted by its size, structure and habits. After planting once it requires no further care. Observations in California have led to these conclusions.

8. *The rise in temperature during the summer months seems not to kill the sticklebacks.* Where other fishes might be killed off in summer in shallow ponds and reservoirs, the sticklebacks seem to live on. These little fishes have even been found in the hot springs of Tia Juana, near the Mexican boundary.

9. *The abundance of sticklebacks in the streams of California provides an ample supply of these fishes for the stocking of artificial and natural pools, ponds and reservoirs.* A fine meshed minnow seine, or one made of from four to six yards of cheap cloth, can be used to obtain these fishes in the waters in which they live.

10. *The stickleback is a hardy little fish and will stand transportation from its native streams to artificial ponds, in open buckets or in cans, such as those used to transport fish fry for planting in streams distant from the hatcheries.*

PRACTICAL USE OF THE STICKLEBACK IN THE CONTROL OF MOSQUITOES.

No artificial cistern, pool, pond or reservoir should be left unstocked with fishes, and for this purpose the stickleback is probably the most practical fish in California, for the reasons which have already been outlined. By its use the breeding of mosquitoes about houses would

be prevented, and a troublesome nuisance and a real source of danger would be largely eliminated, for the mosquitoes which attack us have mostly been bred close by.

There would remain, however, many isolated pools in the salt marshes, along the sides of the lower courses of the streams, and in their upper canyons. These pools are usually without fishes, and in some of them dangerous mosquitoes breed in abundance. The stocking of these pools with sticklebacks would doubtless, in many cases at least, prove both possible and advisable. This might be done independently by those people interested in their own welfare, or perhaps better by some public official. It is quite probable that in the swampy lands and in the rice fields along the Sacramento River, the little topminnows would prove more efficient enemies of the malaria mosquitoes than the sticklebacks. The California Fish and Game Commission is working with that idea in view.

The control of mosquitoes is quite possible, in part by the use of the stickleback, as advocated in this article, and in part by other methods, such as the draining of swamps, etc. It is to be hoped that the proper authorities in California will increase their energy in this field, for the effective control of mosquitoes within its borders would make California an even safer and more pleasant place in which to live than it is now.

EARLY STAGES OF THE SPINY LOBSTER TAKEN BY THE BOAT "ALBACORE."*

By WALDO L. SCHMITT, United States National Museum.

The investigations of the Fish and Game Commission boat, the "Albacore," have recently yielded some valuable returns, during her scientific investigations of the commercial fishes and fisheries of southern California, in the shape of hitherto unknown larval stages of the California spiny lobster (*Panulirus interruptus*).

Under the auspices of the United States Bureau of Fisheries and through the courtesy of the Scripps Institution the writer recently spent some months in California primarily for the purpose of making a study of the Scripps Institution's extensive series of plankton samples in the hopes of shedding some light on the life history of the spiny lobster. Though in considerable number, only the earlier larval stages were represented in their collections.†

*Mr. Waldo L. Schmitt of the United States National Museum has made a special study of marine crustacea and the opportunity to provide him with material for the study of the early stages of the spiny lobster was a very welcome one to the Fish and Game Commission. His visit to this coast came at a time when the scientific work of the "Albacore" was not fairly under way, and the fact that it was able to provide him with material which seems to be of very considerable value points to a happy period for the future. The superintendence of the hauls and of the handling of the nets was very competently done by Mr. Elmer Higgins, attached to the "Albacore" as a scientific assistant during her work on larval fish.

It will be well to call attention to the significance of the wide distribution of the larval lobsters. These flat, transparent organisms are found floating freely in the water and are distributed by the currents. Although we do not know, of course, what proportion of the larvae are carried along the coast by the currents, nor what proportion of these finally succeed in obtaining a suitable footing on the completion of their development, yet it should be fairly clear that there is an intimate relation between widely separated regions inhabited by the spiny lobster.—*Will F. Thompson.*

†Subsequent to the taking of the large phyllosoma referred to below, one of like size was found in the Scripps Institution collections. It is interesting to note in this connection that in one of these large specimens females have succeeded in hatching out the first antennated stage this past summer from the eggs carried by a single berried female.

But on August 29, 1918, while the writer was aboard the "Albacore," four phyllosomes of large size, the largest ever taken off California, were secured with the vessel's small otter trawl. These specimens average about an inch in length, of body proper, and were obtained about 16 miles west of the Coronados Islands in 75 fathoms of water. One of these specimens is shown in the accompanying figure (fig. 14).

Including the above mentioned specimens, the "Albacore" had taken, up to the time of the writer's return from California, some fourteen lots of large and intermediate sized phyllosomes, and another rare stage

Fig. 14. Large phyllosome [illegible]

known as the puerulus. Some of these lots contained numerous individuals. The puerulus is the stage intermediate between the phyllosome, the form in which the "lobster" is hatched from the egg, and the definitive form of the adult. These collections were well distributed through the southern California waters ranging as far as 150 miles off shore and to a maximum depth of 75 fathoms. This is a rather surprising range for such a well known littoral form.

So far as a preliminary examination of the material taken by the "Albacore" together with that obtained from the Scripps Institution goes, it appears that the early life history of the California spiny lobster is in a fair way of solution. A full report of the results of the summer's work is in preparation.

THE COYOTE AS A DEER KILLER.

By E. V. JOTTER.

Although we have long known the coyote as a predatory animal it has only been recently that we have obtained evidence of its destructiveness to big game. Heretofore known as a destroyer of quail, grouse and domestic stock such as pigs, sheep and poultry, the coyote must now be classified along with the mountain lion as a deer slayer.

In that many persons have been slow to believe that the coyote is a factor in our deer supply we have attempted to gather some evidence tending to prove that this animal is responsible for a considerable loss each year in Trinity County. This evidence is presented herewith.

Fig. 15. Male coyote taken in trap January 31, 1918, 14 miles south of Douglas, Trinity County, California, by C. O. Fisher. The stomach contained deer hair and meat. Photograph by C. O. Fisher.

Bert Higgins, who runs a trap line within the Trinity Game Refuge, reports finding along this one line during one month, the remains of fifteen deer killed by coyotes. Ranger Bucklew in April, 1916, saw a full grown doe, apparently in good condition, pulled down by one coyote.

Mr. Wm. Friend writes as follows concerning his experience with coyotes in the Game Refuge:

"In regard to the deer I found killed by coyotes in the Game Refuge, will say I commenced trapping between Little Creek and Bear Creek on February 1, 1916, and between that date and March 2, 1916, I found the remains of seventeen deer killed by coyotes.

They were all sizes from large bucks to fawns, but mostly small deer. The snow was about two feet deep and the deer had collected near the river and in gulches. After the snow settled the coyotes could run on top, but the deer broke through, so it was an easy matter for the coyote to catch them. In one gulch I came down I found eight deer that had been killed at different times, one of them had been killed

recently and none of them were over ten days. In many other sheltered places I found remains. In one instance about Feb. 1, T. H. Campbell and I were riding along the road near Philip Haber's place and saw where coyotes had just killed a spike buck and were enjoying a feast when we frightened them away. I also have a large pair of antlers I brought home from one of their victims. It is not only when the snow is on, but in the spring when the deer are weak, and poor, that they destroy a great many. I was coming home from my traps after the snow had gone and not half a mile from the Van Matre place I saw two coyotes that had a large buck run down and would have killed him if I had not happened along at that time. The deer was not able to get up the bank then."

Ranger Gray's report on the coyote is given in full:

"I would like to emphasize the necessity for a state wide campaign against the coyote and other predatory animals, in which all the people of the state are to a certain extent interested and would help to bear the expenses of such work. It goes without question that a great public benefit would be derived in ridding the country of coyotes, either by increased bounties or by other means that would encourage more trapping. It seems that an increased bounty would be the most effective means of encouraging trapping, and in obtaining the desired result. I have conversed with a great many stockmen and local people during the season with a view to getting actual cases where the coyote has been observed killing game or stock. The result is, few people have been found that have actually seen the coyote killing either wild game or domestic stock; however, they know beyond any question of a doubt that he is responsible for certain large losses in both cases. There is one good reason among others why he is not more often detected in the actual work of killing, for his wandering and search for food is generally done in the hours of the night. In his wild nature he very carefully shuns man, usually selecting the most secluded places in which to carry out his destructive work. Earl Moore, T. Flournoy and other men who have been handling sheep for many years in these mountains advise me that they never saw a coyote actually kill a sheep. However, they state that they have seen them driving and worrying the sheep and upon following the trail they invariably found dead sheep scattered along the route. The greatest losses among this class of stock from the source mentioned is to small bunches separated on the range from the main bands, and left on the range during the night unprotected. W. H. Atkeson of Hoaglin advises me that he saw a coyote kill two small pigs near his ranch house. Many others disappeared in only a few days in the same locality.

Fred Becker, who resides on Pilot Creek, states that he saw four or five coyotes chasing a small deer. He did not know whether the deer was killed. Ben B. Diff of this place tells me that during the past winter a blood trail was noted crossing the road near his ranch house. The tracks of a deer were impressed in the snow together with small tracks that resembled those of small dogs. The trail was followed and Mr. Diff asserts that in a short distance he found the carcass of a large deer and upon his approach two coyotes scampered away. C. W. Vann of this place cites an instance where he saw a coyote catch and kill a quail. Mr. Vann states that while hunting he approached a clump of low brush (poison oak) and flushed a bunch of quail. The quail in leaving the brush were quite close to the ground and he very clearly saw a coyote jump and take one of the birds as it passed very near him. I have found only a few other cases similar to those already mentioned."

Mr. W. T. Shock of Hayfork writes this letter:

In reading over the weekly Trinity Journal I noticed the letter from W. O. Friend in regard to coyotes and as the Forest requests any good evidence against coyotes I submit the following. As I have trapped and hunted the coyote all my life I will write a little of my experience. I find that the coyote is very destructive to many kinds of game of the county, not only deer, but all kinds of birds, such as grouse and quail, the mean of which it robs. A coyote can catch plenty of deer when there is no snow, but it destroys more when the snow is deep. Many deer that are found along the rivers are killed in this way. When the heavy snow comes the deer gather along the rivers and low ground, as the snow is not there. When coyotes get hungry they take after a deer, and if they catch it before it gets to the river they kill it, but if the deer makes into the water, the coyote goes after another one. The coyote will not go into the water, but the deer that run into the water are

so hot and weak that they freeze to death before venturing out again. I have seen coyotes after deer, and running the coyotes away. I have tried to make the deer get out of the water and could not until I helped them out almost dead, and some have died while I was taking them out of the water. I trapped on the Hayfork Creek above the Game Refuge and near Mr. Dockery's place on Carr Creek last winter and a number of deer were gathered at Mr. Dockery's lower barn eating hay with his cattle. Between the first day of January and the twenty-seventh of February I found the remains of twenty deer, either killed by coyotes or run into the creek and killed, and I caught eleven coyotes."

Mr. Edward Shock, who lives within the Hayfork township and within a few miles of the town of Hayfork, upon his own ranch property, called at our office and made some statements concerning the damage done by the coyote, for which he personally vouches. He states that last summer, he does not remember the exact date, while he was working in his garden he heard a noise on the side hill adjoining the garden plot, and upon glancing up, saw a fawn coming down the hill and it ran into his wire fence three or four times before it managed to get through. Closely pursuing the fawn were two coyotes. Shortly after they got in sight they saw Mr. Shock, stopped, then turned and went back into the bushes. The fawn came into the field and quite close to Mr. Shock, then saw him, became frightened, turned and went back through the fence and up the hill in about the same direction the coyotes had taken. The coyotes no doubt later caught the fawn, since they would merely hide away in the bushes for a little while when interrupted in a pursuit of this kind, then take the track and follow on.

Another instance of Mr. Shock's observation was during this fall while setting a coyote trap. He set his rifle down a few feet from him and in finding a place to drive the stakes to hold the trap he had moved a few feet away from the rifle. While busily engaged he heard a noise and looking around saw a young deer without horns, presumably a doe, come running along closely followed by two coyotes, one of which caught the deer while yet in sight of him. Mr. Shock quickly went for his rifle, but when he got it the coyotes had taken alarm and had left the deer. Its tongue was hanging out and it seemed to be just about run down, but it of course went on out of sight. Mr. Shock is firm in his belief, based on his experience, that in such instances the coyotes were merely interrupted and would take the trail again and no doubt catch the deer.

He trapped nine coyotes within two weeks around his place and states that in opening up some of them to see what the contents of the stomachs were he found that they were largely composed of venison, there being evidence in meat, bones and hair. He also states that the coyotes he has caught were all very fat. Mr. Shock says that the reason for his trapping activity was on account of the coyotes catching the chickens. He has found it impossible to raise pigs unless they are well penned. Mr. Shock is a far better trapper than the average settler and has some methods of trapping that seem to get better results than the ordinary trapper. He says, however, that the coyote is a very difficult animal to trap and that he has found that he gets him more through his curiosity than any actual desire for food. Mr. Shock's experiences concerning the coyote are not at all unusual and could be duplicated by a great many of the settlers throughout the Trinity Forest.

These are specific, authenticated facts, which could be repeated by every man who has his eyes open. It really is not surprising that the attitude of mind expressed by the following exists. "Why shouldn't I have a deer," the settler says, "which will be eaten anyway by the coyotes; especially when I have killed one or more coyotes myself." Or, as the trapper would say, "Why can't I get a deer, or three or four, during a year? Even if I kill only one panther or trap only six coyotes, I have done more to protect and to increase the deer than any other person or organization has done."

Two important factors in the reduction of a game species are predatory animals and the hunter. We attempt to compensate for loss by the second factor by closing the season for a period of years to allow recuperation. Why could not similar results be obtained by reducing the toll taken by predatory animals? Although it is true that a certain balance is established between a species of game and its enemies when left to nature alone, it has been frequently demonstrated that man can alter such a balance very much to the advantage of the species that has been preyed upon.

Residents of Trinity County are agreed that by far the most pressing need in efficient game protection lies in the control of predatory animals. The liberal bounty on the mountain lion has eliminated this animal as a serious menace, but the coyote still remains abundant enough to be an important factor in conservation. An increase in deer, quail and grouse can best be effected by a vigorous campaign against the coyote and other predatory animals preying upon them.

CALIFORNIA FISH AND GAME

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All material for publication should be sent to H. C. Bryant, Museum of Vertebrate Zoology, Berkeley, Cal.

February 3, 1919.

"Game laws are not passed with the idea of furnishing sport for a limited number of people, but to protect useful birds and animals for the benefit of the people as a whole."

THE 1916-1918 BIENNIAL.

Although due to war economy the 1916-18 biennial report of the Board of Fish and Game Commissioners is not so large or so attractively colored as the last report, it, nevertheless, contains some interesting facts regarding the activities, receipts, and disbursements of the commission during the past biennial period.

Outstanding features of the work of the past two years have been the erection of a splendid new fish hatchery in Inyo County, the building of a new patrol boat to be used in enforcing the laws in southern California waters and in the carrying on of fishery investigations, the enlargement of the activities of the commercial fishery department, including the administration of the kelp industry, an extensive educational and publicity campaign and the splendid results obtained in enforcing fish and game laws.

New laws enacted by the 1917 legislature have proved valuable. The Supreme Court decisions sustaining the state law prohibiting parcel post shipments of game has effectively stopped a much-used method of evading fish and game laws. The spiked-buck law continues to contribute much toward the conservation of deer, and at the same time has reduced the number of hunting accidents. Seventeen new game refuges created in 1917, comprising a total of 839,180 acres, have been well received by the public and are serving as safe breeding places for game.

The output of the fish hatcheries has been very gratifying, reaching a total of 25,697,429 in 1917 and 26,425,808 in 1916. A 10 per cent increase in the number of trout fry reared has been attained.

Scientific investigations of the fisheries have been undertaken and already valuable light on the habits and life history of the albacore have been obtained. The educational and publicity work of the commission is being well received by the public.

The principal recommendation for new legislation has reference to discretionary powers. Such legislation enabling the commission to close seasons, reduce bag limits, prohibit certain kinds of fishing apparatus, and in general take such immediate steps as will in their opinion afford prompt and effective relief and save from destruction by human hand that part of the wild life which has survived the adversity of nature, is pointed out as the greatest need.

Only a small edition of the biennial has been printed and it will be available only to those sufficiently interested to write to the commission for it.

FISH AND GAME COMMISSION NEEDS PLENARY POWERS.

The most important piece of fish and game legislation which the legislature will be called upon to enact this spring will pertain to the granting of plenary powers to the Fish and Game Commission. The need for this legislation has already been pointed out in these pages. The commission is not seeking more power, but simply a chance to make regulations which will allow better administration of the state's wild life resources. It should be clearly understood that regulations can not be enforced at will by the commission, but only after a hearing has been held and the regulations signed by the governor. The proper administration of the Migratory Bird Treaty Act is dependent upon regulations issued by the Department of Agriculture under authority granted it by Congress. To make the administration of state laws efficient, similar powers should be granted the commission managing the fish and game resources.

CALIFORNIA LAWS WILL BE MODIFIED TO AGREE WITH FEDERAL GAME LAWS.

California was one of the first states to make the game laws conform with those enacted by the federal government and the state has persistently upheld the Federal Migratory Bird Law. It is to be expected, therefore, that at the next legislature the few laws which do not conform with the new Migratory Bird Treaty Act will be modified. The state law still allows hunting one hour before sunrise and one hour after sunset. To agree with the federal law this section of the code will have to be modified so as to prohibit all hunting except between sunrise and sunset of each calendar day. The limit law on geese will have to be changed and the dove season made to begin on September 1. In the few cases where the California laws are more stringent than those of the federal government no change will be made.

VIOLATORS MAKE QUEER DEFENSE.

After some chronic violator of the game laws has been apprehended and a quantity of dried venison confiscated the usual plea is that the confiscated meat is bear meat or goat meat. The bones can be identified or the meat tested to prove that it is venison so that this plea as a rule is of little avail.

The same sort of defense has been offered by a violator recently arrested in Tulare County for having in possession the skin of a mountain sheep. This defendant at first maintained that the sheep was not a true wild sheep and later claimed that he killed the animal in self-defense. It will be an easy matter to prove at the trial that the skin held in possession was that of a wild mountain sheep and the violator will undoubtedly be heavily fined.

[illegible] miles on horses, the fish arrived in excellent condition.

MONTEREY STREAMS STOCKED

Through the efforts of Senator E. S. Rigdon, Salmon Creek in southern Monterey County has been successfully stocked with trout. Although this stream is by nature a splendid trout stream, a large waterfall one mile from the mouth of the creek has made the upper reaches of the stream barren of fish life. It was with difficulty that 18,000 rainbow and steelhead trout recently planted in the stream were transported from the railroad. A fifty-mile haul with auto trucks from San Luis Obispo to Sanco Pojo Creek and then a ten-mile transport by horseback was necessary. The trip was

accomplished, however, without any appreciable loss in the fish. One variety of trout was placed in one branch of the creek and another in the other branch, about ten miles in all being stocked. From all reports the fish are doing well.

DUCK DISEASE AGAIN APPEARS.

During October, duck disease appeared in the Marysville Butte section of the Sacramento Valley. Hitherto, the disease has been restricted to the vicinity of alkaline lakes in the southern part of the San Joaquin Valley. Many hunters hunting near Colusa and Maxwell on the opening day of the season threw away their ducks after they had discovered many sick and dying birds about some of the ponds. The fact that an epidemic of anthrax had been prevalent in the same vicinity led many persons to believe that the ducks had contracted the same disease. This, however, seems very unlikely in that all birds under artificial conditions are largely immune to the disease, and it is not to be expected that birds of any kind would contract the disease under natural conditions. Sick birds secured showed every symptom of "duck sickness," a disease which is now well known through the investigations of the United States Biological Survey. Mr. Alexander Wetmore, assistant biologist, describes the symptoms as follows (The Duck Sickness in Utah. U. S. Dept. Agric. Bull., 672): 1. Paralysis of nerve centers controlling the muscular system (birds affected are able to support themselves in the air for short distances only or have the wings entirely helpless); 2, respiration is difficult and spasmodic; 3, pulse abnormal when bird is excited and in severe cases is weak and irregular; 4, nictitating membrane of eye reacts slowly (a test of the activity of this membrane is an important symptom); 5, eyes usually swollen and a discharge is noticeable; 6, alimentary tract practically empty, intestines shrunken, firm and much reddened; 7, excreta loose and watery, more or less greenish and voided at frequent intervals; 8, birds appear drowsy and lethargic though alert at the approach of danger.

By November 1 the epidemic had subsided and no more sick ducks were to be seen. The number of birds which fell victims to the disease is estimated at 5,000.

FEDERAL PERMITS

The Migratory Bird Treaty Act provides for the issuance of scientific collectors' permits to all those interested in collecting either specimens or eggs, and also to breeders who desire to breed migratory or insectivorous birds. Permits to collect specimens are issued to properly accredited persons only and are required in addition to those issued under state laws. Applications for federal permits can be obtained when applying for a new state permit.

FISH COOKERY DEMONSTRATIONS.

For the purpose of stimulating the utilization of fish products, the United States Bureau of Fisheries has been conducting a series of demonstrations in fish cookery. Demonstrations have been held in San Francisco, Oakland, Berkeley, and Alameda, about 40 in all, with an average attendance of more than 100 women at each class. Mrs. Evelene Spencer and Mr. H. L. Kelly have been in charge. These demonstrations are made of practical value by securing the little-used and low-priced fishes, preparing and cooking them in front of the class, explaining every detail, and then serving each one present with a portion to taste. Even minute details of the proper way to skin a fish, remove the backbone, and slice it are shown. With the class watching, it is prepared for the oven, cooked and served.

Mrs. Spencer recommends the discarding of the frying pan, in favor of the hot oven method of cooking. Advantages are found in the elimination of unpleasant odors, the use of less than half the amount of fat usually required, and greater ease for both the cook and the one who has the serving of the fish. This is the method she uses in doing the work herself, and all who eat the cooked fish agree that it far excels in flavor the same kind of fish fried in the old-fashioned way.

The making of salads, both from freshly steamed fish, or from left-over fish is explained as is also the making of souffles, creamed dishes and imitation

chops. Soups, which for flavor are the equal of any which can be made from meats or oysters, are made from the heads and trimmings ordinarily considered as being only fit for the garbage can.

Thirty-four varieties of fish, not including salmon and halibut, have been used in the demonstrations. Thus, it has been shown that a housewife can cook fish any day in the month, if she wishes, and not have the same kind twice. Of these, the most popular were small sole, skate, sablefish, mackerel, kingfish, yellowtail, shark, shad, rockcod and salmon milts. The price of these fish ranges from 5 to 15 cents per pound, and many hundreds of women were surprised to find a number of them they preferred to even salmon or halibut, which cost from 25 to 40 cents per pound.

Needless to say, these demonstrations have proved very popular with housewives, and have added materially in increasing the demand for flounder, shark, skate, squid, sablefish and other low-priced fishery products of the California markets.

INCREASED CONSUMPTION OF FISH NECESSARY.

Increasing the consumption of fish is far more urgent today than during war times. There is now no submarine menace; there are more ships and there are 200,000,000 people who must be fed if they are to be saved from starvation. Every ton of nonperishable goods possible must be sent to Europe. The use of fresh fish releases easily-shipped meat products for exportation.

There is absolutely no limit to the amount of fish which is now waiting in the ocean, and more are growing to supply our needs. The people of California have responded to every call made on them thus far, and we urge that they continue to show their patriotism and humanitarianism, by a still greater use of fresh fish.

NOTES ON THE NEW GAME REFUGES.

The following notes relative to the recently-formed game refuges have been culled from forest officers' reports for 1917. Apparently, the new refuges are filling the place for which they were set aside.

All refuges in California are created under the districting act and so must be designated as a "fish and game district." Each refuge is lettered with the number of the main game districts of the state in which the refuge is situated prefixed to it.

Fish and Game District 1-A, located in the Klamath National Forest, is admirably situated for the purpose for which it was withdrawn, being a natural breeding ground. It covers an area of about one township and varies in elevation from about 1,700 feet at the Klamath River to about 7,000 feet at the highest point, thus giving both winter and summer feeding ground. The general exposure of the entire area is southwestern, which makes it the very best from a climatic standpoint. There is also one of the largest salt licks known near the center of this refuge.

When the refuge was first created there was much opposition to it, but lately the sentiment has been more favorable.

Fish and Game Districts 1-B and 1-C in Modoc County are ideal breeding places for game and there is absolutely no doubt as to the wisdom of the move in having these areas set aside. The people, as a whole, are strongly in favor of them.

Fish and Game Districts 1-I and 1-J, in the Tahoe and El Dorado National Forests, have not been in existence long enough to note any change in game conditions. While the people most affected accept the establishment of the districts as a matter of law, some criticism is voiced relative to the location. Why was it not located "somewhere else" is the usual comment. This attitude will gradually disappear after a time if the districts receive proper administration.

The people all seem to think that the Chimney Meadow Refuge (Fish and Game District 1-L) will be of great value to the deer as it is the wintering grounds for all the deer in the Cannell Meadow District. Thos. Smith and John Johnson claim that they counted 75 deer in one bunch last spring in Long Valley, which is a part of this new refuge. There are a great number of hunters from Los Angeles and the Mojave Desert that hunt in this proposed refuge, and it will require a regular paid game warden in that vicinity to properly administer the refuge.

Fish and Game District 2-A covers a fine piece of deer country, having both summer and winter range. The establishment of the refuge was very well received by the public, and it is believed that very little hunting has been done within its boundaries. Considerable complaint was made by hunters and others, because the boundaries of the refuge were not posted. This should surely be done before the opening of the next hunting season.

The people are in favor of Fish and Game Districts 4-A and 4-B, comprising

(illegible) acres within the Angeles National Forest. Deer are becoming more and more plentiful. If anyone is benefited by reason of an open season, it is the resort owners, and yet with the possible exception of one owner, a man who has been in court several times for alleged game violations, I have yet to find a resort owner who is not in favor of the continuance of the game refuges.

When Fish and Game District 4-C was first formed the sentiment against it was very strong. This has changed and one finds very few hunters who do not favor it. The deer are increasing and one sees them in regions where there have been no deer for several years. With the increase of the deer a noticeable increase in mountain lion signs are also seen. Several lions have been killed and many of the better class of sportsmen are talking of plans to rid the range of this pest. Our greatest trouble, however, is not the lion, but the unscrupulous hunter who sneaks over the boundary of the refuge.

A NEW GAME FARMING PROJECT.

A beautifully illustrated prospectus entitled Wisconsin Zoological Park, for the Propagation, Improvement, and Utilization of Wild Life has recently been issued by a newly-formed corporation with headquarters in Chicago. The intent of the organization is set forth as follows:

Food, it is said, will win this war. And it therefore becomes the duty of everyone to give careful consideration to all plans to increase our food supply.

The American farmers, responding to their country's call, are planting every available foot of their land, which means that we have about reached our maximum in food production unless we can devise some way of utilizing the undeveloped regions. Naturally, our thoughts turn to the nearby cut-over timber lands as a possible solution of this problem. We all understand the difficulties that have presented an almost insurmountable barrier to the development of these sections and the necessity, on account of the scarcity of labor, of finding some use for this land without having to clear away stumps, rocks and timber.

The Wisconsin Zoological Park was created chiefly for the purpose of dealing with this problem. It proposes that these lands be used just as they are, in the breeding and raising of wild life objects as a source of supply.

This is a comparatively new idea, and to be understood and appreciated must be carefully studied. The purpose of this booklet is to explain some of the most important features of this enterprise.

This company proposes to demonstrate in a practical manner how cut-over land can be quickly and profitably utilized in accordance with the ideas above set forth, and at the same time carry on extensive experiments towards the development, improvement and preservation of wild animals.

It is hoped the company will become self-sustaining, but if it does not, those responsible for it have not been actuated by selfish motives. They appreciate that pioneers in any great enterprise must take chances of loss, but are confident of their ability to eventually work out a plan which can be followed with profit by others.

To the uninitiated the plan is a very plausible one, and it will doubtless appeal to many. In view, however, of the success thus far attained in game farming, the outcome of the project as a commercial enterprise seems doubtful. If it will lead to the setting aside of large areas as breeding grounds for native animals, it will be very much worth while.

LOUISIANA ORIGINATES NEW DUCK.

The Department of Conservation of the state of Louisiana is attempting to secure a new duck for their marshes by breeding. The experiments are being carried out on the assumption that if a cross between the summer mallard or black duck and the winter visitant greenhead mallard could be established a race of nonmigratory ducks could be produced for the Louisiana marshes. The new type of mallard is in the third generation and a type has been selected which appears to have characteristics of both the mallard and the black duck. Whether the new duck will become a permanently resident bird capable of being introduced remains to be seen.

ALASKA FISHERY PRODUCTS.

The Fisheries Service Bulletin states that although final figures showing the value of the fishery products of Alaska in 1917 are not yet obtainable, the statistics are practically complete so that a reasonably accurate statement of production can now be made. Compilations indicate that the total value of such products was $51,405,260 in 1917. Of this amount 93 per cent, or $47,778,081, represents the value of the salmon products which consist of 5,947,286 cases of canned salmon, valued at $46,304,080, and 16,347,367 pounds of mild-cured, pickled, dry-salted, fresh and frozen salmon, valued at $1,473,991. The halibut fish-

ranks next second with an output of products valued at $1,120,226. In the order of production, the herring fisheries come next, with a yield of products valued at $767,729. The value of the cod products was $744,976. Whaling operations returned products worth $653,852. The production of miscellaneous fishery products including clams and other shellfish aggregated $340,286 in value.

This unprecedented yield of fishery products in Alaska at a time when the world is in need of food is called an achievement, for which the country may justly feel gratified.

The fur products of Alaska are also of considerable importance and value, as evidenced by the fact that in the year from November 16, 1916, to November 15, 1917, shipments from that territory reached an aggregate value of $1,031,638, exclusive of fur-seal skins and fox skins shipped by the government from the Pribilof Islands. In the calendar year 1917 the government shipped from the Pribilof Islands fur-seal skins valued at $274,291 and fox skins valued at $35,080.—Science, June 7, 1918.

NOVA SCOTIA USES WAR METHODS TO CAPTURE VIOLATORS.

The fact that most of the illegal fishing in Nova Scotia has been carried on by means of nets in the darkest hours of the night when it is impossible to discover the offenders without some means of artificial illumination has prompted authorities to furnish wardens with "Trench Light" pistols. These lights which have been very effective by the allied armies and navies are contained in metallic cartridges and are fired from a breech loading four-bore pistol which throws the magnesium stars to a distance of 400 or 500 feet. The lights burn for five or ten seconds and light up the whole neighborhood so that everything can be distinctly seen even on the darkest night. In addition to its efficacy in illuminating, it acts as a weapon of self-defense which poachers will learn to fear as much as the revolver. The "trench light" has been decided upon only after experiments with acetyline searchlights, electric searchlights, and magnesium Roman candles.

CALIFORNIA TRAPPERS AND THEIR CATCH.

For the open season 1917-18, nearly 4000 trappers' licenses were issued. As the trappers' license law provides for the killing of fur-bearers destroying poultry and domestic animals, no record can be obtained of those so killed and the reports of trappers of the take for the year do not give the total number of animals taken. However, the reports do give a basis for a computation as to the value of the annual take of furs. According to the reports of those holding trappers' licenses the take for last year was as follows:

Species	Number taken	Average price
Skunk	10,480	$1 74
Mink	804	2 95
Pine marten	127	5 90
Fisher	23	
Weasel	47	
Badger	82	
Raccoon	2,309	1 87
Ring-tailed cat	1,381	40
River otter	25	
Fox	2,294	2 16
Bear	35	
Coyote	1,941	3 00
Mountain lion	7	
Wild cat	1,488	1 73
House cat	111	
Opossum	19	
Muskrat	60	
Woodrat	20	
Mole	3	

The wolverine is apparently a very rare furbearer and not a single skin of this animal was reported. It is also interesting to note that such well-known furbearers as the marten and fisher are so reduced in numbers in this state that only a small number were taken in 1917-18. The average price indicated was obtained by averaging the amount received for at least 100 different pelts of a species.

FACTS OF CURRENT INTEREST

A recent report from the United States Supreme Court does not concern the present regulations regarding migratory birds, but relates to the regulations in effect previous to the signing of the treaty with Canada. The present regulations are based on a treaty and will be in effect for fifteen years, unless abrogated by consent of both contracting parties. Because the present regulations are based on a treaty they can not be reviewed by any court.

On information furnished by deputies of the Fish and Game Commission three violators of the Federal Migratory Bird Treaty Act have been arrested and each is being held under a $250.00 bond.

Steelhead trout fishing in the Russian River will be excellent this year. The bar is open and there is plenty of water.

February 1 will mark the close of one of the best quail seasons in many years.

The elimination of market hunting by federal enactment has reduced to a minimum violations of the laws protecting waterfowl.

The game refuges created by the last legislature have now been posted and hunters will have no excuse for hunting within them.

Plans are being made to secure some moving pictures of the commercial fisheries of southern California to be used in educational work.

The State Game Farm at Hayward was discontinued on November 16, 1918.

Deputies of the Fish and Game Commission in the areas where there is waterfowl shooting have been appointed federal wardens. Twenty-one deputies now hold federal commissions.

Federal permits allowing a rice grower to herd ducks from his fields put a stop to agitation relative to depredations by ducks. No appreciable damage to rice when in the shock was reported.

The epidemic of duck disease in the vicinity of the Marysville Buttes was of short duration and less serious than similar epidemics which have occurred at Tulare Lake in past years.

HATCHERY NOTES.

W. H. SHEBLEY, Editor.

FISH DISTRIBUTION, 1918.

While the fish distribution operations for all of the hatcheries were completed by the forepart of October, complete reports have not, as yet, been filed. However, it is possible to give an approximation of the total distribution from the different stations for the season of 1918.

MT. WHITNEY HATCHERY.

The past season has been most favorable for operations at the Mount Whitney Hatchery, and the trout distributed were some of the finest fish ever reared at any of our hatcheries. Some of the eastern brook and Loch Leven trout distributed this year were from four to

Fig. 17. Wild geese at fish pond, Mount Shasta Hatchery, September 30, 1918. Photograph by J. L. Stuart.

MT. SHASTA HATCHERY.

The approximate total number of fish distributed for the season was as follows:

13,500,000 quinnat salmon.
2,000,000 rainbow trout.
1,100,000 eastern brook trout.
1,000,000 Loch Leven trout.
2,000,000 steelhead trout.
220,000 black-spotted trout.

Two fish distribution cars were operated during most of the distributing season. The fish were all strong and healthy, and nearly all applicants reported that consignments were received and planted in the streams in good condition. Mount Shasta Hatchery is now being put in readiness for the coming season's trout operations and for the salmon work.

five inches in length, which is a very remarkable growth for one summer. Following is an approximation of the number of fish distributed:

1,000,000 rainbow trout.
83,000 eastern brook trout.
70,000 Loch Leven trout.
240,000 steelhead trout.
240,000 black-spotted trout.
400,000 golden trout.

The golden trout eggs were obtained from the Cottonwood Lakes Station, which was established for the purpose. Owing to the remoteness of this station from railroad lines and the rough, almost inaccessible country through which the eggs had to be carried by pack animal to the Mount Whitney Hatchery, the extent

of our operations was necessarily limited, but we feel that the results obtained have justified all the hard work and expense. Although several efforts have been made in past years to collect the eggs of the golden trout, this is the first attempt that has been successful. The success of the operations this season is due to the skill and resourcefulness of Mr. George McCloud, Jr., who was in personal charge of the golden trout egg collecting operations at Cottonwood Lakes and of the Mount Whitney Hatchery, at which station the eggs were hatched and the fry reared. The golden trout are very difficult to rear, but the results obtained in this delicate work far exceeded our expectations.

Plants of golden trout were made in the Santa Ana River, San Bernardino County, and in Mammoth Creek and Convict Lake, Mono County. A shipment of golden trout was planted in Lake Tahoe, and a consignment sent to Mount Shasta Hatchery to be liberated in the McCloud River at a later date. Practically all of the waters of southern California and the lower San Joaquin Valley counties were stocked with fish from the Mount Whitney Hatchery this season.

Fish Distribution Car No. 01 was detached from distribution operations at Mount Shasta Hatchery the forepart of September and sent to southern California to undertake the shipping of fish from the Mount Whitney Hatchery. The work was completed in a little over a month. After the completion of the season's fish-cultural operations the crew was assigned to make the improvements on the Mount Whitney Hatchery grounds, and this work is now progressing nicely.

MT. TALLAC HATCHERY.

The Mount Tallac Hatchery was operated as in past seasons, black-spotted trout eggs being taken from the fish ascending Taylor Creek to spawn. In addition to the 1,200,000 eggs of this species hatched at the station for distribution in the tributary streams of Lake Tahoe in the vicinity of Mount Tallac, shipments of eggs were made to Tahoe Hatchery, Mount Shasta Hatchery and the Feather River Experimental Station; 150,000 rainbow and 380,000 steelhead trout fry were also distributed in the tributary streams of Lake Tahoe from Mount Tallac Hatchery this season. The steelhead trout should thrive well in the waters of Lake Tahoe, and the addition of this valuable species of trout to the other varieties in the lake will be greatly appreciated by the anglers of the state who enjoy the fishing in this region.

TAHOE HATCHERY.

From Tahoe Hatchery were distributed 15,000 rainbow and 420,000 black-spotted trout fry in the streams and lakes in the Tahoe Basin and in the vicinity of Truckee.

FORT SEWARD HATCHERY.

The streams of Humboldt and Trinity counties were stocked with rainbow and steelhead trout fry to the number of 200,000 and 1,000,000 respectively from Fort Seward Hatchery this season. Mad River, tributaries of Humboldt Bay, and Eel River and tributaries, received most of the fish.

Quinnat salmon eggs received from egg collecting operations on Eel River near Bryan's Rest last fall were hatched at Fort Seward Hatchery, together with shipments of eggs of the same species from Mount Shasta Hatchery, and the resulting fry to the number of 1,000,000 were planted in Mad River, tributaries of Humboldt Bay and Eel River. As egg collecting operations near Bryan's Rest were not satisfactory, a new experimental station was established this fall on Bull Creek, a tributary of Eel River, near Dyerville. Owing to the fact that there was not enough rainfall to raise the river sufficiently to enable the spawning fish to ascend the stream, no Quinnat salmon eggs were taken early in the season, but later rains during the month of November improved conditions.

DOMINGO SPRINGS STATION.

The season's operations at Domingo Springs Hatchery were very successful. In addition to the rainbow trout eggs sent to other hatcheries, 317,000 were hatched and the fry planted in lakes and streams in Lassen and Placer counties. A shipment of 100,000 steelhead eggs was sent to Domingo Springs, and the resulting fry planted in lakes in that vicinity.

UKIAH HATCHERY.

The streams of Mendocino and Sonoma counties received their usual portions of steelhead trout fry from Ukiah Hatchery this season, 420,000 fish being planted in the two counties.

ALMANOR HATCHERY.

Egg collecting operations at Almanor Hatchery resulted in a take of less than 2,000,000 rainbow eggs. The resulting fry were distributed in Lake Almanor and near by streams.

FEATHER RIVER HATCHERY.

Operations at the experimental station established near Blairsden on the Western Pacific Railroad were not successful, as the water supply from Grey Eagle Creek did not prove to be satisfactory for fish-cultural operations. Rainbow and black-spotted eggs were shipped to the station to be hatched and reared, but they died in great numbers both before and after hatching. The station has been dismantled, and the equipment will be used at one of the other stations.

BEAR LAKE HATCHERY.

Fish distribution operations were finished on September 5, and the station closed after completing the most successful season since the hatchery was established. At the egg collecting station on North Creek, 3,500,000 rainbow eggs were taken. After being "eyed," they were shipped to Mount Shasta, Mount Whitney, Tahoe, and Bear Lake Hatchery at Green Spot Springs; 300,000 were also hatched at the North Creek Station, and planted in Big Bear Lake. A total of 1,075,000 rainbow trout fry were distributed in streams of San Bernardino County, and in Big Bear Lake, from Bear Lake and North Creek stations. At the present time assistants are engaged in making repairs and improvements at the two stations. Negotiations are now under way for the purchase of a fine power boat for use in egg collecting operations, transferring materials and supplies, etc., which will greatly facilitate the work next spring.

BROOKDALE HATCHERY.

Steelhead trout fry to the number of 700,000 were distributed in the streams of Santa Cruz and Santa Clara counties from Brookdale Hatchery this season, in addition to shipments of steelhead eggs made to Mount Shasta and Mount Whitney hatcheries for distribution in other sections of the state.

WAWONA HATCHERY.

The completion of the new hatchery at Wawona enabled us to handle the fish to much better advantage this year. Streams in the vicinity of Wawona received 75,000 rainbow and 195,000 steelhead trout fry.

CLEAR CREEK HATCHERY.

A small hatchery has just been completed on Clear Creek, Lassen County, near Westwood. Eggs will be shipped to this station from Almanor and Domingo Springs hatcheries next season, and the fry hatched for distribution in the streams in the vicinity of Westwood.

KLAMATH RIVER STATION.

The new Klamath River Hatchery, which is being constructed by the California-Oregon Power Company, and which will be turned over to the California Fish and Game Commission when completed, in lieu of the construction of a fish ladder over the Copco Dam, is well under way. As it was not possible to complete this hatchery in time to trap this year's run of Quinnat salmon, a temporary station was established at Klamathon. Owing to the failure of the main run of salmon to reach the point at which the racks are located, on account of the long dry fall, the take is therefore much below normal.

COMMERCIAL FISHERY NOTES.

N. B. Scofield, Editor.

TIDE CONDITIONS INJURE FISHERIES.

The unusual conditions of water temperature and currents along the California coast during the past summer were largely responsible for a greatly reduced catch of albacore in southern California and evidently caused the appearance of new and strange fishes as elsewhere noted in this magazine. They also affected the catch of sardines and salmon and seriously handicapped the

growth of kelp. For nearly five months sardines were not found in sufficient numbers in southern California to keep the canneries busy.

Kelp. The kelp on the surface of the water ceased to grow and the serious shortage of this seaweed which occurred made it very difficult for the kelp potash companies to secure enough to supply their plants. It is feared that even the new shoots, which come up and take the place of the long stipes on the surface of the water after they have been cut, have been killed. The best growing time of the kelp has usually been in the winter months. Just how the stunted summer growth will affect the growth during this winter is as yet unknown.

It is now quite certain that the close of the war will have the effect of putting many of the California kelp potash companies out of business. Before the war the price of potash was about $45 per ton, but for the past year it has been between $250 and $350 per ton. If the price of potash decreases one-half, the majority of the companies will have to cease operations. Already the demand for potash to be used in the manufacture of munitions of war has ceased to exist. The immense plant of the Hercules Powder Company near San Diego has discontinued harvesting kelp and has issued notice to its one thousand employees that shortly their services will not be required. This company has done a great deal of investigation work in developing important by-products through the manufacture of which they expected to be able to continue operations even after the close of the war, but it has finally been decided that in view of the market prices that will have to be met shortly and the entire lack at present of a market for certain of the by-products, it will be best to reduce the operations of the plant to a very small scale and only two or three by-products will be produced there with a small force.

Salmon. The salmon catch at Monterey during the summer was only about half the usual amount. The fish almost entirely disappeared before the end of May. The catch for June, which is usually large, was a failure. But the fish which escaped the hooks of the fishermen in Monterey Bay later made their appearance in San Francisco Bay and the Sacramento River on their way to cast their spawn in the river's headwaters. Their appearance in the river was much later than usual and at the time when the fishermen and salmon packers were importuning the Fish and Game Commission and the Federal Food Administration to extend the season the salmon put in their appearance in great numbers. For a period of two weeks the salmon kept coming in such numbers that sufficient help could not be obtained to take care of the catch. The final result has been that the combined catch of Monterey Bay and the Sacramento River was the largest for several years. The amount of salmon taken up to the end of September in Monterey Bay, outside of the Golden Gate, San Francisco Bay and the Sacramento River was 11,040,075 pounds.

The catch of salmon by trolling at Fort Bragg was good; the total amount of the catch reaching a million and a quarter pounds. The run at Eel River was considered a failure, the amount taken being less than half the usual catch. The run on the Klamath River also shows a falling off.

THE SALMON INDUSTRY MENACED

To dam the waters of the Sacramento at the narrow Iron Canyon above Red Bluff and thus make an immense impounding reservoir for flood control and irrigation purposes, has for years been a dream of those who would develop the resources of the upper Sacramento Valley and of those who have been interested in controlling the floods on the lower river. There have been frequent efforts to make this dream come true, but it is only recently that there have been hopes of its realization.

It is now proposed by assessing the land in the area to be benefited and by the aid of the state and the United States government to raise $20,000,000 for the construction of the dam and irrigation canals. The site of the dam is seven miles above Red Bluff. The proposed dam will be so high that salmon ascending the river to cast their spawn will not be able to pass even by means of the best "fish ladders" which have been devised. An impassable dam at the Iron Canyon will cut the salmon off from all the upper tributaries in which they naturally spawn, with the exception of Mill

Creek. If remedial measures can not be devised three-fourths of the present salmon run will be lost.

Remedies which suggest themselves are to attempt to establish runs in other streams, especially in tributaries of the San Joaquin and to establish a hatchery at the dam. Many difficulties present themselves in any plan to catch salmon at the dam, chief of which is unsuitable water temperature. Salmon of the spring run will not be mature enough to warrant holding at the dam for spawning purposes and if eggs are collected at the dam from the summer and fall run, the water available for the hatching will be too warm. Even if the eggs could be held in a hatchery at the dam until they are "eyed" at which stage they could be shipped to other hatcheries more favorably located on the river above, there would still be the problem of getting the resulting fry down over the dam in their seaward migration.

If such a dam is built, and it appears now it will be built, the salmon industry is sure to suffer an irreparable loss.

SPERM WHALE TAKEN OFF MONTEREY.

On November 21, Monterey fishermen found a dead sperm whale off Point Pinos near Monterey. They towed the carcass to Monterey where it was sold to one of the local fish concerns for $200. The length of the whale was 65 feet and it produced ten barrels of case oil. This species of whale is very scarce on this coast, and according to old residents of Monterey this is the first sperm whale that has been taken in that region for at least forty years.

LOCATING SARDINES BY AEROPLANE.

The serious shortage of sardines in southern California during the past summer has suggested the idea of locating the schools of sardines by means of aeroplanes. The great difficulty in catching sardines is in locating the schools of fish. On account of light on the surface of the water it is difficult to locate a school of sardines unless the boat runs into them. Fishing is usually carried on at night, at which time the phosphorescent glow caused by the swimming fish is more easily seen, but even at night this phosphorescent light can be seen only a short distance. It is a well-known fact that schools of fish can be more easily seen from an elevation where the observer is away from the glare of the reflected light at the surface of the water. From an aeroplane schools of fish are easily seen which are invisible to a person from the deck of a boat. At such times as fishermen are unable to locate schools of sardines, or of albacore for that matter, it would be practicable to employ an aeroplane for the purpose, which adds one more argument for those who would commercialize the aeroplane.

NEW WHALING STATION ON MONTEREY BAY.

The California Sea Products Company has almost completed a large, modern, fully equipped whaling station at Moss Landing on Monterey Bay, which will employ forty men when in operation. In addition to the whaling plant this company expects in time to operate a sardine cannery and during off seasons to use their boats to supply fish to the fresh fish trade.

There has been some objection to the establishment of a whaling station on Monterey Bay for fear that it would injure the sardine industry, under the belief that it is the whales that drive the sardines into the bay. This is an old belief which comes to us from the European coast where at one time it was believed whales drove the herring into the sheltered waters of the bays and fjords. Herring do not enter sheltered waters along the coast to escape whales, but for the purpose of spawning in the shallow waters where their eggs are attached to rocks and seaweed. There is no evidence that whales drive sardines into bays.

NEW FISH NET

A new fish net has been devised for catching sardines and other small fish known as the purse-lompara net. This net is in use at Monterey and is in all respects a lompara net except that a purse line has been added to the bunt of the net which enables the operators to pull the lead line in more quickly after the net is partly in, thus impounding the fish in the bunt of the net. With this net it is easier to catch sardines in the day time without their sounding and getting under the net when it is operated in deep water. By using this semipurse arrangement a shallower net than otherwise can be used, which makes its operation quicker and more economical.

CONSERVATION IN OTHER STATES.

CONSERVATION LESSONS FROM MASSACHUSETTS.

The Massachusetts Fish and Game Commissioners are calling attention to the need of the conservation of fish by means of "little lessons." One of them follows:

"The advance of civilization always decreases the natural fish and game supply. Preach and practice conservation.

"Don't take fish that are full of spawn; leave them to deposit their eggs and the small to grow into mature fish.

"Don't take more than you need.

"Don't try for the largest number; try for the largest fish.

"Don't try to get the last one; leave some for others.

"Report violations to the Fish and Game Commissioners.

"Remember, this is your sport. No one is as interested in it as the hunters and fishermen, and it is up to you to make or ruin it."—*American Field*, May 2, 1918.

CATS BECOME GAME IN NEW YORK.

In New York a bill has been passed, permitting any person over twenty-one years of age who holds a hunting or trapping license to destroy humanely a cat at large found hunting or killing any protected bird, or with such a bird in its possession. The bill makes it the duty of the game protectors to kill all offending cats.

MINNESOTA GAME REFUGES.

In the State of Minnesota state parks and state forest reserve lands have automatically become refuges for game. The legislature of 1915 provided for a practical way of establishing game refuges on privately owned land. Already seventeen refuges have been established in this way, embracing 331,925 acres. The combined area of all of the Minnesota game refuges is 1,877,813 acres. This method of protecting and restoring game has met with instant and hearty approval by the people of the state and in every instance in which a refuge has been established, there has been a unanimity of sentiment among the people interested in it.—Bien. Rpt., Minn. Fish and Game Comm., 1916.

MINNESOTA DISTRIBUTES FISH.

Under the authority of the Public Safety Commission, the state of Minnesota has been catching and distributing fish. From October 15, 1917, to January 1, 1918, the production of state-caught fish amounted to 77,861 pounds. Great care is being exercised not to take fish that are desirable for angling from localities where people can and will use lakes for that purpose. In such localities fishing is confined to rough fish only. As a contribution to the food supply the state fishing has demonstrated its importance and has proved to be popular and successful. Distribution has been made through game wardens, representatives of the Safety Commission, meat dealers and other individuals.

NEW JERSEY RESTOCKED WITH RABBITS.

The game farm of the New Jersey State Fish and Game Commission has two thousand rabbits which will be distributed throughout the state. Rabbits will be placed in districts where they have been hunted out.

LIFE HISTORY NOTES.

TREE-DUCKS SUCCESSFULLY BRED IN SANTA CLARA COUNTY.

A pair of fulvous tree-ducks (*Dendrocygna bicolor*) were secured from the State Game Farm in the fall of 1916 and placed on my pond at Cupertino. In June, 1917, I had a suspicion that they were laying, as I found several eggs which I could not classify in different parts of the enclosure. I have learned from experience that one can not disturb ducks during the laying and breeding season, and in the past I know that I have broken up several "settings" because of my curiosity. In June of this year I noted from casual observance that only

one of my fulvous ducks was on the pond, and fearing that the other had been lost or had died, I started an investigation and after some days found the nest very close to the water's edge on a ledge of rock in a rustic rockery constructed in the pond for ornamental purposes. This ledge was concealed by overhanging vines and it was very difficult for me to see it. Not wishing to disturb the birds, I did not make a close investigation, but as near as I could tell, there were five or more eggs in the nest. (This last is somewhat of a guess on my part.) As the birds seemed to be sitting, I left the nest severely alone, and some time around the 20th of June (I can not give the exact date) I was rewarded in seeing the mother duck bring out four young ones into the pond. These little birds did not appear to me to be much larger than young quail and I used my very best efforts in an attempt to segregate them, but without avail. My present pond is not constructed properly for breeding purposes, having been erected in the first instance purely for ornamental purposes, and the birds have not access to and from the water at all points, with the result that these little ducks became chilled and drowned, or were molested by the other ducks, all dying within four or five days. —J. V. DeLAVEAGA.

RARE FISH FROM MONTEREY BAY

The true halibut (*Hippoglossus hippoglossus*) was occasionally taken this last summer (1918) in Monterey Bay. It has not been reported before south of San Francisco.

A specimen of a fish sometimes called the "blacksmith" (*Chromis punctipinnis*) was brought to Hopkins' Marine Station at Pacific Grove by Japanese fishermen this summer. This fish has hitherto been unknown north of the Santa Barbara Channel.—E. C. STARKS.

MARLIN-SPIKE FISH USED AS FOOD.

The marlin-spike fish (*Tetrapturus audaxii*) now being caught by anglers near Santa Catalina Island is finding a good market in Los Angeles at a retail price of 25 cents per pound. It is said to be undistinguishable in taste from the swordfish. The writer recently enjoyed eating some of it, and found it one of the most delicious fishes he had ever tasted. Fresh tuna was served at the same time for comparison. It was much coarser fleshed and much less delicately flavored than the marlin-spike fish.—E. C. STARKS.

BREEDING OF THE FULVOUS TREE-DUCK IN SANTA CLARA COUNTY.

Early in the month of November, 1917, a fulvous tree-duck (*Dendrocygna bicolor*) was brought to me for identification by Miss Ethel Emerson. It had been caught when but a downy bird in the salt marsh near Mountain View, Santa Clara County, and was now nearly grown. Several others taken at the same time had died, one by one in captivity, but the survivor, when placed in a large cage with a pair of bantams, soon became very active and contented. Later its plaintive whistle might be frequently heard during the night, and at times it seemed to show irritation at close confinement. It remained wild and was easily frightened at the approach of people or other animals, as dogs and cats. When opportunity offered it made its escape after having spent somewhat over a year in captivity.

The most interesting point in all this is that it appears to furnish the first account of the breeding of the species in the marshes of San Francisco Bay, and I believe that the bird has not been recorded before in Santa Clara County. —J. O. SNYDER.

BANDED PINTAIL TAKEN IN ALAMEDA COUNTY.

On November 13, 1918, I shot at Alvarado, California, a pintail duck (*Dafila acuta*) bearing a metal band stamped "U. S. Biological Survey, No. 4000." Upon returning this band to Washington the following information was obtained:

The duck was captured while sick with alkali poisoning at Utah Lake, cured and banded October 10, 1916, after which it was exhibited with others at the Utah State Fair, and released. Its capture is good evidence of the permanence of the cure and is of interest because of the fact that over two years intervened between capture and the date of banding.—EARLE DOWNING.

REPORTS.

CALIFORNIA FISHERY PRODUCTS—JULY, AUGUST, SEPTEMBER, 1918.

Species of fish	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Solano, Yolo	Sacramento, San Joaquin	Alameda, Contra Costa	San Francisco, San Mateo	Santa Cruz	Monterey	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego	Total	Mexico
Albacore										918	6,183,413		816,705	7,001,036	
Anchovy	100		3,840				40,120		114,450		21,300		400	180,210	50
Barracuda							7,146	48,887	144	21,367	720,000		373,657	1,171,201	10,000
Bonito								3,991	3,990	10,241	788,073		670,160	1,472,464	1,645
Bocaccio		1,093	1,995				1,424	354	286,656					290,529	
Bluefish									31,291					31,291	
Chilipepper							997		972					1,969	
Carp				1,187	12,775	5,588	347							19,897	
Catfish		200		644	1,469	1,422								3,735	
Croakers											20,754		884	21,647	
Coalfish							56,189		37					56,226	
Cultus cod	420	11,852	6,116				224,053	42,437	38,228		1,613			307,395	
Dolphin											720			720	
Dogfish			74,920				27,570		1,486		497		6,127	110,600	1,641
Flounder	705					38	381,278	25,123	740		32			407,916	
Halibut	19,750	30,172	1,894				1,738	1,731	11,756	87,825	83,045		20,977	232,235	1,439,057
Hake							54,132	8,000	320	64			497	62,953	
Herring	174									175				349	
Kingfish							24,973	10,508	54,097	400	38,771	100	2,155	124,004	
Mackerel								620	611,927	4,280	780,377		24,000	1,735,504	4,120
Mullet											2,014			2,014	
Marlin															
Pike						274								274	
Pompano							567	325	97		1,488		160	2,537	
Perch	10,646		518				12,984	794	320	810	4,140		200	29,612	
Rock bass										2,400	17,280		60,000	79,680	3,000
Rockfish	20,650	484	240				408,698	10,887	310,584	12,501	109,981		175,566	1,049,104	4,000
Sole	93						1,344,186	681,864	71,736	22,680	4,770			2,125,329	
Salmon	511,711	676,297	136,842	1,949,735	462,984	2,856,514	1,335,920	77,405	151,165					4,129,855	
Smelt	2,654		12,984			25	56,252	10,875	167,000	7,268	18,601	1,335	7,215	236,877	20
Sea bass (white)			24				28,240	17,000	47,000	36,254	68,350	100	21,471	220,465	3,000
Sea bass (black)										2,197	46,280		21,500	67,977	2,000
Sand dab							326,634	6,500	1,702		4,000			338,836	

Sablefish														
Striped bass			1,857											
Surf shad														
Shad														
Buck shad														
Steelhead														
Sturgeon														
Sardine	761													
Skate														
Sword fish														
Scorpin														
Surf fish														
Sea trout														
Sheepshead														
Trout cut														
Trout (fancy)														
Trout (steelhead)	7,279													
Turbot														
Tuna														
Whitefish														
White fish														
Yellowtail														
Miscellaneous	3,000													
Totals														
Crustaceans—														
Crab (fine)	40													
Spiny lobster														
Shrimp														
Prawns														
Mollusks—														
Squid														
Cuttlefish														
Clam pismo														
Clam mahogany														
Clam softshell	1,000													
Clam razor														
Clam (other) No.														
Oyster, Eastern														
Abalones														
Mussels														

*Eastern. †Native.

VIOLATIONS OF FISH AND GAME LAWS.

September 1, 1918, to December 1, 1918.

Offense	Number of Arrests	Fines Imposed
Game.		
Hunting without license	28	$ [illegible]
Deer—close season—killing or possession	4	[illegible]
Female deer, spike bucks, fawns—killing or possession	25	[illegible]
Running deer with dogs, close season	1	[illegible]
Failure to retain portion of deer head bearing horns	[illegible]	[illegible]
Illegal deer hides—possession	2	[illegible]
Bear—close season—killing	1	
Quail—close season—killing or possession	11	[illegible]
Doves—close season—killing or possession	2	
Duck—close season—killing or possession, excess bag limit	7	[illegible]
Shooting ducks from power boat in motion	1	[illegible]
Cottontail and brush rabbits—close season—killing or possession	2	[illegible]
Rail—close season—killing or possession	1	[illegible]
Wild pigeon—close season—killing or possession	1	[illegible]
Nongame birds—killing or possession	8	[illegible]
Shore birds—close season—killing or possession	3	[illegible]
Night shooting	14	[illegible]
Total game violations	126	$2,662 [illegible]
Fish.		
Angling without license	[illegible]	[illegible]
Fishing for profit without license	[illegible]	[illegible]
Fishing with nets in restricted district	6	[illegible]
Striped bass—underweight	[illegible]	[illegible]
Salmon—Saturday and Sunday fishing close season—taking or possession, excess limit	7	[illegible]
Clams—undersize—excess limit	2	[illegible]
Abalones—undersize—shipping out of state	5	[illegible]
Spiny lobsters—close season—taking or possession	1	
Total fish violations	12	$1,30[illegible]
Grand total fish and game violations	138	$4,9[illegible]

SEIZURES—FISH, GAME AND ILLEGALLY USED FISHING APPARATUS.

September 1, 1918, to December 1, 1918.

Game.	
Deer meat	124 pounds
Hides	6
Ducks	12[illegible]
Quail	[illegible]
Doves	1
Shore birds	4
Nongame birds	[illegible]
Rabbits	[illegible]
Miscellaneous game	[illegible]
Fish.	
Striped bass	841 pounds
Salmon	15,665 pounds
Trout	64 pounds
Crabs	157
Pismo clams	483
Abalones	121
Illegal nets	3
Searches.	
Illegal fish and game	4

STATEMENT OF EXPENDITURES—YEAR 1918.

Item — expense	May	June	July	August	September
General administration	$1,994 69	$1,875 19	$2,288 08	$1,844 69	$1,822 96
Research, publicity and educational (game)	422 19	569 83	533 24	259 49	965 59
Printing	262 48	45 00	769 95	511 84	
Fish exhibits		5 50			
Game exhibits		3 50			
Game farm	307 07	249 99	265 26	286 32	174 15
Mountain lion bounties	200 00	170 00	380 00	130 00	180 00
Lithographing hunting licenses	995 00				
Lithographing angling licenses					
Hunting license commissions	1,681 70	596 60	807 70	692 50	2,857 90
Angling license commissions	709 10	1,100 90	1,500 90	280 50	1,244 90
Market fishing license commissions	349 75	41 50	47 50	73 50	53 00
	$6,941 98	$4,398 31	$6,392 63	$4,178 75	$6,094 10
San Francisco district	$5,334 17	$5,788 45	$5,903 32	$6,398 24	$6,241 56
Sacramento district	3,542 81	3,704 20	4,026 63	3,905 00	4,003 60
Los Angeles district	2,537 28	2,462 45	2,304 60	2,128 17	2,491 26
Launch patrol	903 72	1,056 29	1,350 96	1,209 66	924 41
Preventions (fish and game)	104 75	318 49	93 50	73 75	87 85
Crawfish inspection	33 33				
Winter game feeding					
Accident and death claims	124 04	155 05	185 19	186 35	124 04
	$12,580 10	$13,484 93	$13,903 60	$13,901 17	$13,872 62
Hatchery administration	$1,030 65	$841 61	$1,081 33	$817 63	$1,040 81
Mount Shasta hatchery	1,544 41	2,024 76	3,812 12	6,679 96	3,080 54
Klamath station	6 60	5 60			805 99
Mount Whitney hatchery	2,168 48	1,974 57	1,774 34	2,512 81	2,204 94
Castle and Lakes station	58 48	675 60	196 10	45	
Tahoe hatchery	40 19	96 00	205 19	246 38	260 30
Tallac hatchery	886 16	405 06	469 74	206 61	67 85
Fort Seward hatchery	500 61	461 69	398 41	283 80	100 00
Eel River station				4 75	486 50
Ukiah hatchery	448 30	293 64	187 30	187 83	5 20
Snow Mountain station	155 60	100 00			
Brookdale hatchery	230 09	203 72	291 16	340 13	204 61

Item of expense	May	June	July	August	September
Scott Creek station	$76 00	$30 00	$167 00	$31 00	$30 00
Feather River hatchery	23 27	194 56	156 06	20 15	
Almanor hatchery	719 20	146 00	113 10	140 10	1 50
Domingo Springs hatchery	203 80	137 72	170 56	264 34	56 43
Clear Creek hatchery					25 00
Bear Lake hatchery	566 83	102 85	247 47	136 84	292 10
North Creek station					
Wawona hatchery	114 80	68 00	98 39	24 95	
Yosemite hatchery					
Fish distribution	373 68	963 15			
Fish transplantation			4 56	3 00	2 00
Screen, fishway and water pollution	473 36	586 19	1,022 78	744 51	409 80
Special field investigations			205 20	65 00	
	$10,108 54	$10,190 72	$10,289 90	$12,743 03	$9,944 84
Department of Commercial Fisheries	1,927 88	2,765 49	2,603 42	2,508 55	1,546 90
	$31,558 42	$31,139 45	$33,497 45	$39,421 80	$31,758 70
Department of Engineering—					
Launch "Albacore"		$3,709 42	$43 40		
Yosemite hatchery					$327 27

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THE CONSERVATION OF OUR FISHERIES.

By WILL F. THOMPSON.

Fisheries are subject to depletion because of too intense exploitation, as has been proved in Europe and in our own country. It is the duty of the government, as the one element in the situation which is concerned with the perpetuation of the fisheries, to be able to recognize depletion, to know how to prevent it, and how best to promote the fisheries. It implies knowledge, perhaps not of what we are fond of terming pure science, but rather of applied, although the things to be applied are frankly still in large part to be discovered. Men engaged in educational work are almost invariably engrossed in the more abstract branches of science, and the commercial firms are thus far not interested in carrying on research save for the purpose of furthering the methods of utilization of the products. It is therefore left very largely to governmental authorities on whom the responsibility of regulation rests, to pursue the subject.*

*See Fish Bulletin No. 2 for a more extensive discussion of this subject.

But what are the problems involved, and what must be done to recognize depletion? A fishery is, one may say, the reaping of a harvest which has been sowed by Nature, and is subject to great natural fluctuations and has unknown power of resistance in the face of continual reaping. The primitive man who went into the rice swamps and gathered his rice, without thought of how it was sowed, or how long it took to grow, was no worse than we are in our primitive attitude regarding our fisheries. The failure of his crop threatened his livelihood, yet he knew nothing regarding the causes of the failure, nor the fluctuations which might occur. What were these changes, were they due to his continual reaping, were they preventable, or might they be foretold? Just so we are asking today, what are these great fluctuations in our fisheries which may mean the prosperity or ruin of our industry, and how may they be prevented or foretold? If we can not cultivate, how may we preserve? They are elemental questions, indeed, to be asking on the threshold of an era of exploitation.

Fig. 18. Diagram of halibut beds in the North Pacific, illustrating the areas within which halibut are considered plentiful enough to justify fishing. Depths shown by contour lines, fishing area by stippled spaces.

Men in general do not know what they are dealing with when they pursue a fishery for a certain species. Thus the conception that a species is as inexhaustible as the ocean is large is an erroneous one. The fish in the sea are distributed as unevenly throughout its parts as wild animals are on the land, with this qualification, that only the borders are inhabited by them to any extent. Thus a halibut fishery exists only on particular small areas called banks, or parts of banks, along the edge of the continental self in from thirty to a hundred and fifty fathoms where the conditions are suitable. In fact, just as mountain sheep are limited in their range, so are the halibut.

Then what strain will a species stand? Some think that the capacity of a species is limitless, because of the great number of eggs each individual produces. The halibut lays over a million and a quarter eggs every year of its breeding life, perhaps ten million in all, and the male produces the fertilizing sperm for the same; but this abundance of eggs merely foreshadows many dangers to the young, for from these ten million need come but two mature animals to maintain the species. If there were constantly more than necessary to maintain the numbers of the species, then the resultant increase must, however slight, eventually overcrowd the waters of the sea; and if there were ever so small a lack every year, then the species must vanish ultimately. Man's influence, however slight, like weighted dice in a game, might well, in the end make loss inevitable if it were not for the probability that many forces come into play to favor threatened species. Are these forces potent enough to counterbalance man's influence? Do we know that they are sufficient to avert final loss?

But has there ever been such a loss? Have not men fished for many centuries in the waters of Europe without over-fishing? Why should depletion occur now rather than long ago? But we know that this very thing has happened, and that there is good reason why it should have happened in our day. The great plaice fisheries in the North Sea have been proved over-fished, and in our own waters the halibut fisheries and those for the salmon of the Frazer are good examples of the same. And the reasons are not far to seek. They may be found in the relatively recent invention of the canning process, in the use of steam and gasoline for transportation, and in the use of ice and cold storage methods of preserving food. Salmon from the Frazer is known in Africa and Mexico nearly as well as we know it in America. Halibut taken by steamers and gasoline-driven boats in the Pacific is carried by express trains across the continent and across the Atlantic to England in a fresh condition. The cold storage and the canning of fish have abolished boundaries and "off seasons" in so far as many species are concerned. The net result of all this has been the recent vast enlargement of the market, and with that has come the equally vast enlargement of the fishing industry. This marvelous growth of our fisheries has not been appreciated, I am sure. Our sardine fishery, totaling in 1917 over 100,000,000 pounds, has arisen within the last four years. The great halibut fishery, which reached a maximum of 70,000,000 pounds a year, began in 1890, and is now on the decline. What will the future show to us in this regard? Well may we think seriously, and consider our words when we feel tempted to say that the resources of the sea are inexhaustible. The population to be fed may double its numbers in the next fifty years, and transportation may become twice as efficient. **What will happen then?**

And if the total catch continues to increase, as it has in the past, how may we recognize the commencement of depletion? First of all we must discount in our statistics the marvelous growth in apparatus and equipment, and discover whether a greater effort is required each year to gather the same amount of fish, in other words, ascertain whether decreased abundance necessitates greater effort. This means the abandonment of the old statistical ideal of portraying the magnitude of the industry, and substituting for it a more rational one of the observation of **the real abundance of the fish.**

But when a decrease is discovered, we must know whether it is a natural one or due to over-fishing, and we must know in time to take remedial measures, not when commercial extinction has solved our doubts. For there are great fluctuations in abundance (of very different extent in the various species) which are not the result of man's efforts but of natural causes, and a decrease in numbers of fish because of such is, of course, not permanent, any more than the causes are. To know the character of such a decrease implies a study of the biology of the species, which provides a distinctive mark for the results of over-fishing in many cases, if not in all. It also implies advancement of the science of the subject, a greater knowledge of the laws which govern the matter, for what is known at present is undoubtedly ill-defined.

The laws seem to be much the same as those which govern the human population, and the results of over-fishing what might be expected if "over-fishing" of human beings could be carried on in the same way. If the adults are removed by "over-fishing" the relative numbers of the adults decrease; and if the fishery continues to remove an equal number, the catch becomes a constantly greater proportion of the total left, thus heightening the rate of decrease. But if the young are not produced because of defective spawning conditions—which can not be blamed on the fishery—then the young are less numerous as compared to the undiminished numbers of adults until the latter have lived out their term of life. Decreased abundance of fish because of "over-fishing" of the older classes is therefore marked by decreased numbers of the older fish as compared to the young, while the reverse is true in the case of a natural decrease because of the failure of the young to appear. The inference is obvious, a record of the relative numbers of adult and young must be kept in connection with a record of the total abundance, and from it can be ascertained just where the less in abundance occurred, the degree to which the fishery is responsible being to a great extent obvious therefrom.

If the failure of a spawning season could be ascertained early enough, it would provide a knowledge of the impending change. The value of such knowledge may well be illustrated by the history of the herring in Europe. It is well known that from the dawn of history great natural fluctuations in its abundance have occurred, according to which a great industry has been built up or destroyed, carrying with it the fate of whole towns. Recent studies by scientists in the Norwegian fisheries service seem to show that it is possible to forecast the magnitude of

TABLE 1.

Table* Showing Percentage of Each Age in the Catch of Norwegian Fat-herrings in Various Years, Illustrating the Appearance of an Unusually Abundant Class as Successive Ages in the Catch of Successive Years.

Catch	Age when taken							
	1 year,	2 years,	3 years,	4 years,	5 years,	6 years,	7 years,	Total,
During 1907	11.5	35.8	51.3	0.4				100.0
During 1908	0.4	51.4	10.3	37.8				99.9
During 1909	3.1	81.0	13.3	5.0	16.9	0.7	0.2	
During 1910	0.1	76.7	42.0	6.2	1.7	1.5	0.1	

*Note.—From Hjort and Lea, "Some Results of the International Herring Investigations," 1907-1911.

the yield according to the sizes of fish taken. A great drop in the abundance of the herring was apparently preceded by the failure of the youngest classes to appear in adequate numbers,—in other words a predominance of mature existed at the same time as a decrease in catch. The success of the commercial fishery for herring during a number of years, in fact, seems to have depended on the success of a single year's spawning, the product of which became larger and older every year but which was not supplemented by young produced by subsequent spawnings. The result was the lack of small fish until another successful spawning could occur. The consequence of the gradual natural disappearance of the old fish in such a case, without another class of small to take their place, may be easily imagined. If fluctuations of such magnitude as occurred in the herring fishery could be foretold, the doing so would be a truly great accomplishment for the good of humanity.

Yet such a service would not be comparable to that of showing that a species as a whole is in danger, that man's operations are incurring a preventable catastrophe. Depletion from over-fishing is, obviously, very likely to be confused with natural decreases due to things other than over-fishing, or man's demand for food. The ability, then, to distinguish natural fluctuations due to the spawning seasons for instance, should enable us to recognize the results of over fishing with greater clearness. This is without doubt the most important service to be rendered by a study of the fluctuations.

So we must observe the classes of various aged fish as early as possible, distinguishing them with the greatest possible exactness, in order that the nature of a change in abundance may be known, whether caused by natural fluctuations or by over-fishing. How far this is from realization in all of our species is a striking testimonial to the indifference of man.

To do these things we must know the ages of the fish taken. We must be able to contrast two-year-old fish with those six years old, to recognize the youngest fish, and to be able to tell in what year any individual or class of individuals was born. If we do not know the year of birth we can not trace back the failure of the spawning season to the occurrence of any particular phenomenon or group of phenomena. This means the discovery of the age of the fish, not merely of a particular class, but of the individual, a subject difficult in itself.

We may illustrate the most obvious method of finding the age by comparing the fish on a given bank to an orchard planted at different times. There will be some variation, but trees planted in a given year will approach the same height, and the heights for the successive years will be very different. So if all the trees planted in each year were grouped, we might have well-defined size groups, and anyone looking at them would say, here is the one-year group, here the second, and so forth. And so it is with the fish; they arrange themselves in natural groups, according to the age. But when they become very old, the growth both of the trees and of the fish slackens, so that the difference between those born in different years becomes less than the difference between individuals, and the age can not be told.

But this is a cumbrous method. It could be carried out once in each case, to corroborate other methods, and then also used, as has usually

been done. A preferable method is to use the marks left on the hard parts of the fish, just as it is possible to use the rings left in the wood of the tree.

The reason for these marks is thought to exist in the nature of the growth of the fish. Its surroundings govern its growth, just as its temperature depends entirely on the temperature of the water. The seasons modify profoundly all the conditions of its surroundings, and with them the growth of the fish. During the winter months, growth and activity become much decreased, somewhat as those of a lizard or snake do. The tree grows by adding to its trunk a thin layer of woody tissue, and the part laid down during the colder months of the growing

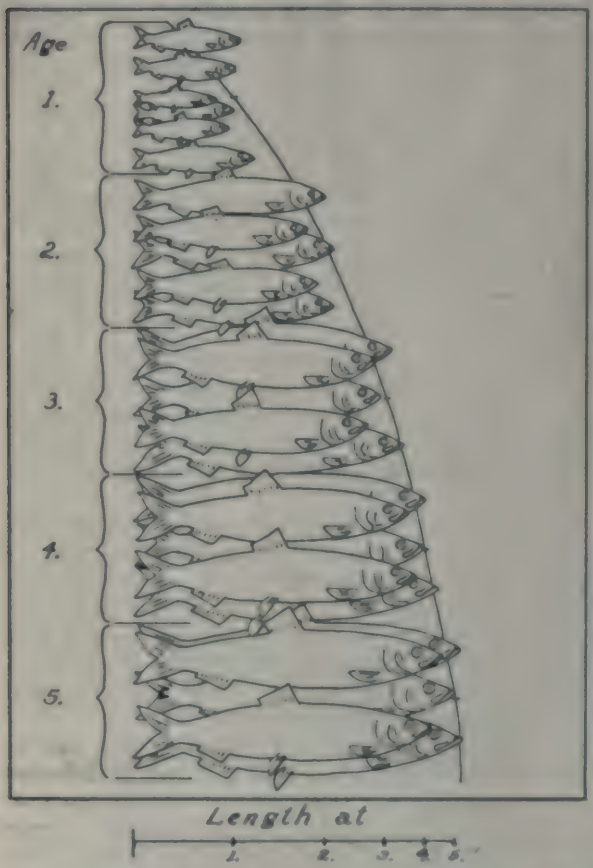

Fig. 17. Groups of fish of various ages, showing distinct difference in size between the early age groups, and the difficulty of distinguishing older ages by size alone. Average length of each group shown on line below, indicating the decreasing rate of growth with age.

season differs radically in structure from that laid down during the warmer. And so it is, presumably, with the fish and its hard parts, such as the scales, the otoliths or ear bones, and the bones of the body and head, although to be sure we can not attribute all the changes to the one condition, temperature, directly. The growth is by addition, leaving behind the old structure to tell the tale of the seasons that are past. Forest trees may tell of fires that have passed their way, of cold years, of warm years, of crowding by other trees, and of all the tragedies of the forest. So in a measure do the scales of the fish tell of birth, of years of plenty and of scarcity, sometimes of spawning, of injury, and

of migration, but through it all there is the tale of the seasons, the fundamental rhythm of existence among the lower animals.

We find that a scale is made up of many small rings, or circuli, but that at certain regions these are closer together, or that there is a mark or break in the continuity of the pattern on the scale. These parts which are thus marked are those in which the growth was affected, or even stopped. So there is a mark on the scale of the fish when it reached its first winter; and what was added during its second and its third summers, is clearly separated by other winter marks. We find that when we read the ages by these scales, the individuals in each of the size groups mentioned above and compared with trees in an orchard, are of the same age, and that the first size group has one annual ring, the second two and so forth, showing that the reading from the scales

Fig 20. Scale of Fraser River sockeye salmon, Bellingham, Washington, June 18, 1917, from female, 23 inches long, in fifth year, showing approximated circuli marking the winter growth, the end of which is indicated by a line in each case. (After Gilbert, Rept. British Columbia Commissioner Fisheries, 1917.)

corresponds with the size groups and hence must be accurate. Such a comparison has not been carried out in all species, but in a sufficient number to place the facts on a firm basis.

The same is true of the otolith. It is a calcareous formation in the ear of the fish, which grows by successive excretions. The ear of the fish is not visible from the outside, but is nevertheless well developed, with semicircular canals much like those of man, and in one of the sac-like parts is deposited the otolith. The portions formed during the winters have much less organic matter in them than the layers formed during the summers, and hence are easily distinguishable.

Thus we may know the age of the fish, and know when it spawns, how old it becomes before it dies, and we may know these things regarding each individual. This renders it possible to know in what year fish belonging to an abundant year class were spawned, and under what conditions they were born; therefore, why they were abundant. Without a knowledge of this kind, which would indicate when the results of particular phenomena might be expected to become evident, it is obvious that the careful study of such phenomena is meaningless from the standpoint of the fisheries. The age reading also renders it possible to accurately compare the numbers of fish of various ages, something we could not otherwise do, because if we relied on size groups we would confuse the ten year old fish with those nine and eleven years, or even eight and twelve years old. But aside from these more important things, there are, naturally, many things upon which a knowledge of the age throws light. Thus it is possible to prove that fish grow faster in one locality than in another. There is, indeed, much to be worked out,

Fig. 21. Otolith, or ear bone, of halibut, in tenth year, showing dark "winter" zones and white "summer" zones. (After Thompson, Seventh Annual Report, Commission of Conservation, Canada.)

and much to be proved in the case of the individual species, and even in regard to the general principles governing the different species.

In every species the light thrown by a knowledge of age, even when most brightly, is dependent for its importance on a knowledge of whether it is shown for the whole of a species or for merely a small part which may happen to be involved by the fishery. We must know whether the locality is representative, or whether it is isolated from the others. Perhaps we could catch all the fish in one locality and the numbers of fish in other localities would not diminish, there being therefore no danger to the species as a whole. Similarly, the value of protection to a limited area is subject to the same considerations. But, it may well be asked, how is it possible to discover this isolation, when we can not

see below the surface of the waters to watch the coming and going of the fish? It is difficult, but possible, as we shall see.

We know that when a village of men is isolated, and the inhabitants interbreed for a sufficiently long time, a dialect grows up, and ultimately certain physical characteristics seem to mark the inhabitants. The formation of the dialect is a rough measure of the degree of isolation of the group. So it is with a school of fish, or those inhabiting a certain region, their separation from others leads in time to the formation of small peculiarities of habits and structure. If the separation is simply lifelong, perhaps only those characters will be changed which have to do with the amount of food obtained, such as the length of the head and the rate of growth. But if isolation is complete, and has lasted for many thousands of years, there are deeper, more fundamental differences, of habit and structure. These are indications of the degree of isolation.

TABLE 2.

Table Showing Difference in Number of Vertebrae Between Herring From British Columbia and California.*

Locality	Specimens counted	Average of count
British Columbia		
Point Grey	100	51.8
Pender Harbor	96	51.8
Pender Harbor	981	51.75
Kitimaat	100	51.8
Nanaimo	200	51.8
California		
San Francisco	81	50.7

*From Thompson, "A Contribution to the Life History of the Pacific Herring," Report British Columbia Commissioner of Fisheries, 1916.

Therefore, it has become a well-recognized method of research, to take samples of fish from different regions and to compare them carefully by minute measurements, such as the length of the head, the shape of the skull, and the number of fin rays. The results are sometimes astonishing, for well-recognizable groups may be made out in many species of fish. The implication is always that there is no migration between the groups, that each group has its home waters, to which it is confined, or that it has well-defined habits which keep the stocks separate.

Another method used is to place on the fish silver tags, piercing the fins or the body for the purpose, and then to release the marked individual alive, with the hope of retaking it, or of having a fisherman return it. By keeping a record of where and when the fish was released, it is possible to discover how far it has traveled and at what rate. The trouble, naturally enough, is that the fish, because of the irritation, may travel farther and faster than it ever would naturally, and may perhaps leave "home" when it would not under usual conditions.

Sometimes advantage is taken of the fact that fish from a certain locality may be characterized by marks left on the scales by some local condition. Then the dispersal of the marked group may be traced from

year to year. An attempt has been made to use this method in the case of the herring, and also in the case of the sockeye salmon, where the scales are marked by the character of the growth during the first year or two. In the latter this has led to the identification of the birthplaces.

There are also other methods used of discovering the rate of movement, but none as valid. Thus when fish are abundant in one locality during one season, and abundant in another during the season following, migration is naturally supposed, by many people, to have occurred. In an extreme case of the use of this method, mackerel being abundant in Europe while they were not in American waters, many men drew the conclusion that the mackerel had migrated across the Atlantic. But there was no evidence to show that the disappearances and appearances were not simply the result of great fluctuations in the success of the spawning seasons. The dangers of such conclusions should be obvious, particularly when the imperfection of any known measure of the real abundance of the fish, such as the returns from particular methods of fishing commercially, is known. There were also at one time theories that the herring of European waters lived around the North Pole, and that they came down from the Arctic seas in great armies, the German *Heere*. These armies, or schools, were supposed to move around England and return to the far north. Now it has been proved that the herring of the Baltic, of the English Channel, of Iceland, and other localities, are of separate stocks which intermingle but slightly, if at all, and that they do not migrate in any such fashion. The method used to discover the truth was that which has just been mentioned of measuring the physical characteristics.

On the whole the tendency is to discredit migrations of great extent, but there are several marvelous migrations well known. Certainly the eel, which lives in fresh water, goes into mid-ocean to spawn. And just as certainly the salmon of the Pacific comes in out of the sea and passes up rivers thousands of miles long to spawn at the headwaters. But the quick assumption of long marine migrations, as that of the albacore into Mexican waters, is certainly to be deprecated. It is so easy to postulate complex migrations to explain varying appearances of fish in different localities in different seasons that to every species is ascribed such movements by the fishermen, with all the certainty in the world. But it is better, without doubt, to suspend judgment until actual facts from other sources are at hand to corroborate such theories.

It should be evident from what has been said that there is much to learn before over-fishing may be ascertained, or its extent judged. The problems to be met are large ones, yet not insuperable. The application of the acquired knowledge in order to prevent depletion is a considerable problem in itself. Over-fishing may always be stopped by restricting the fishery in any way, however crude and harmful the restriction may be, but the application of measures which will so distribute the restriction as to do the least harm to the fishery and the most good to the species is a different matter. Primarily, it is possible to restrain the fishery wherever it imposes its greatest drain on the supply, with a good chance of effectiveness; but that might not be the best available method. The most general principles underlying the subject are, as a matter of fact, unknown or undiscussed, despite the many legal measures passed by the legislatures.

We may ask, for instance, why the spawning season should be so persistently an object of protection. The eggs are slowly developed throughout the year, indeed throughout the life of the individual, and the death of a female in January certainly destroys as many eggs as its death in June, if the spawning season comes in June. The matter would seem to be one of securing the survival of an adequate number of individuals throughout their normal lifetimes, so that there would be enough of them to produce eggs. But that implies care that too many young are not taken, just as it implies care that too many adults are not taken. In short, the value of the individual at the various times of its life must be known, so that it may be used when it is of the least value to the species and of the most value to the fisherman. We are still far from such a knowledge of biology as that implies.

The impression that it is sought to convey throughout this paper is that in order to conserve our fisheries, there are many problems to be solved, all of them important. Among them that of the adoption of statistical methods having for their object the ascertainment of the abundance, rather than the amount taken, easily comes first. But such a substitution can not be made without a knowledge of biology to supplement and guide it. And the biological phases of fishery science are in themselves many and important, dealing as they do with the rate of growth and the movements of the fish. Then finally, there is almost no adequate knowledge concerning the methods of conservation, or the prevention of depletion. We are at the threshold of a period of exploitation of our fisheries and we must be sure that we begin an era of scientific investigation of our fisheries in time to adequately guide and control the exploitation.

The dependence of the statistical method and biological study upon each other necessitates their prosecution by an agency capable of giving the investigation its needed scope. Adequate statistics can be gathered by a government only, and the same is true of the biological data required. The responsibility therefore rests upon the state, in whose hands lies the legislative control of the fisheries.

THE BASSES AND BASS-LIKE FISHES OF CALIFORNIA.

Families Serranidae, Haemulidae, and Kyphosidae.

By EDWIN C. STARKS, Stanford University, California.

The basses are the most fish-like fishes, so to speak, for they represent more than others the typical spiny rayed fishes. They have been usually selected as types of fishes for books of anatomy and textbooks since the time the great French zoologist, Cuvier, so used the yellow perch early in the last century.

All of the families of bass-like fishes group about the central family, Serranidæ. They and the mackerel-like fishes apparently were descended from a common ancestor. Also related to the basses are the croakers, though less closely than any of the fishes here included.

It is not at all desirable to here discuss the technical characters that define these fishes. It is sufficient to say that the first dorsal fin is made up of spines, the ventrals are placed but little behind the pectorals and joined to the shoulder girdle internally, the anal fin is usually with three spines, the ventrals with one spine and five soft rays, and the scales

rough with little spinules on their margins. This last may be appreciated by passing the finger over the scales in the direction of the head.

Representatives of this group occur everywhere in fresh and salt water, except in the Arctic regions. They are very numerous in the tropics and often very brilliantly colored. Among them are some of the largest of bony fishes as well as some of the smallest, ranging downward from the giant sea basses to the pigmy sun fishes and darters, some of which are fully grown at a length of between one and two inches.

KEY TO THE BASSES AND BASS LIKE FISHES OF CALIFORNIA.

1. The vomer with teeth. A small portion of the upper edge only of the maxillary hidden by the bones just above it (preorbital bones) when the mouth is closed.
   2. Side of body with well-marked lengthwise stripes. *Striped bass. Roccus lineatus.* **Page 62.**
   2-2. Side of body without well-marked lengthwise stripes.
      3. Spines of first dorsal shorter than rays of second. The two dorsals not much united. Size very large. *Black sea bass or Jewfish. Stereolepis gigas.* **Page 62.**
      3-3. Longest spines of first dorsal as long or longer than the rays of second. **The dorsals broadly united. Size not excessively large.**
         4. No small round spots on head or body. The third dorsal spine not over twice as long as the second and a little shorter than the fourth. The preorbital bone at its narrowest part scarcely over half as wide as the diameter of the eye. *Rock Bass or Sand Bass. Paralabrax clathratus.* **Page 66.**
         4-4. Numerous small round spots scattered over the head, or head and body. The third dorsal spine at least three times as long **as the second, and longer than the fourth. Narrowest part of preorbital about as wide as eye.**
            5. The small round spots confined to the side of the head, **and usually some are on side of tail just in front of the caudal fin.** ***Johnny Verde or Kelp Bass, Paralabrax nebulifer.*** **Page 68.**
            5-5. **The small round spots scattered over the head and almost the entire body and fins.** *Spotted Kelp Bass or Cabrilla, Paralabrax maculatofasciatus.* Page 67.

1-1. The vomer without teeth. A considerable part of maxillary slipping under **bones just above it, when mouth is closed.**
   6. Pectoral fin pointed and reaching past tips of ventrals.
      7. A dark band extending downward from middle of spinous dorsal. **Base of pectoral black. Third anal spine shorter than second.** ***Sargo, Anisotremus davidsoni.*** **Page 63.**
      7-7. No dark band downward across body, but several dark stripes running lengthwise on body. Third anal spine longer than second. ***Big-Eyed Bass, Xenistius californiensis.*** **Page 64.**
   6-6. Pectoral fin rounded and not reaching past tips of ventrals.
      8. No scales on gill cover behind preoperculum. Each tooth divided into three points. Dorsal and anal rounded in outline. *Goggle-fish or Opal Eye, Girella nigricans.* **Page 65.**
      8-8. Gill cover fully scaled. Teeth single pointed. Dorsal and anal rising to an angle in front, straight edged or slightly concave along tips of rays when fin is spread, and sharp pointed behind as tip of last ray. *Half Moon Fish. Medialuna californiensis.* Page 66.

GLOSSARY.

***Anal fin*:** The unpaired fin along the lower side of the body.

***Caudal fin*:** The tail fin.

***Dorsal fin*:** The fin along the back. Sometimes separated into a first and second dorsal, the first part, whether separated or not, composed of spines in these fishes.

Fin rays: The softer elements that stiffen the fins. Differing from spines in not being sharp. They are usually branched like those that make up the second dorsal in these fishes.

Fin spines: Stiffer than rays, sharp at the tip and unbranched.

Head: The head is measured from the tip of the snout along its side to the edge of the gill cover.

Lateral line: A line of pore bearing scales along the side of the body. In these fishes it is more or less arched upward and follows the outline of the back.

Maxillary: The flattened bone just above the mouth and just above and behind the premaxillary.

Operele: The gill cover just behind the preoperele.

Pectoral fins or *pectorals*: The fins just behind the gill openings, one on each side of the body.

Premaxillary: The bone bordering the upper jaw that bears the teeth.

Preoperele: The bone just behind the cheek that forms a ridge downward across the gill cover and turns at an angle forward.

Preorbital: The bone just in front and below the eye. It reaches downward to the maxillary and its surface is covered with thin membrane.

Snout: That part of the head in front of the eyes.

Ventral fins or *ventrals*: The pair of fins on the lower side of the body under the pectorals.

Vomer: A single unpaired bone that lies in the roof of the mouth directly behind the middle of the upper jaw. Do not mistake the palatines for it. They lie one at each side of the vomer parallel with the side of the jaw, and may or may not bear teeth.

FAMILY SERRANIDÆ.

The Striped Bass (Roccus lineatus).

This well-marked fish may be at once known by the dark horizontal stripes on the body, teeth on the vomer, a spine at the angle of the gill cover, and the pectoral fins not longer than the ventrals and not reaching

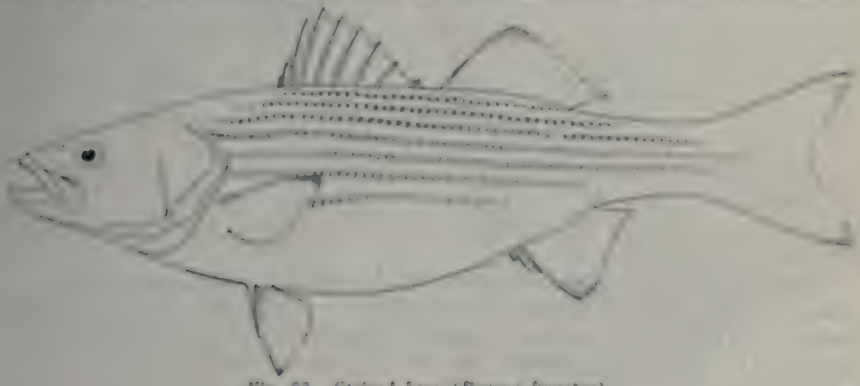

Fig 22. Striped bass (*Roccus lineatus*).

so far back. There is another fish on our coast that has such stripes, but they are not so well marked and it lacks the above combination of characters. The eye is three or four times wider than the narrowest

part of the preorbital just below it. The maxillary reaches to below the middle of the eye. The mouth is armed with rather fine sharp teeth. Scales extend on top of the head to in front of the eyes. The edge of the preopercle is divided into many small sharp spines. The dorsal fins are separate from each other and about equal in height. The second dorsal and anal have a sharp angle at the tips of the first rays. The middle caudal rays are shorter, making the outline of the fin concave.

The color is silvery with brassy and coppery reflections, and marked with seven or eight blackish stripes, one of which is along the lateral line.

The striped bass, though not a native member of our coast, is one of our important food fishes. It was introduced from the Atlantic coast and has become abundant. It is caught to the limit of safety to the species, and being a much advertised fish it commands a high price. Though it is without question a very fine food fish, it is rather overrated. This fish reaches a weight of 80 or 90 pounds, and one was once reported on the Atlantic coast that weighed 112 pounds.

The Black Sea Bass or Jewfish (Stereolepis gigas).

This gigantic fish may usually be known by its size. The body is broad and robust, and covered with rather small scales. The top of the head between the eyes is wide and not very convex. The eyes are small, several times shorter than the length of the snout or the space between them. In small ones the edge of the preopercle is divided into spines, but the edge becomes nearly entire in large ones. Fine teeth are in broad bands on the jaws. The dorsal fins are separate, and the first one is composed of short, stout spines that are shorter than the rays of the second dorsal. The pectorals are rather round in outline, and reach past the tips of the ventrals. It is very dark brown or nearly black in color.

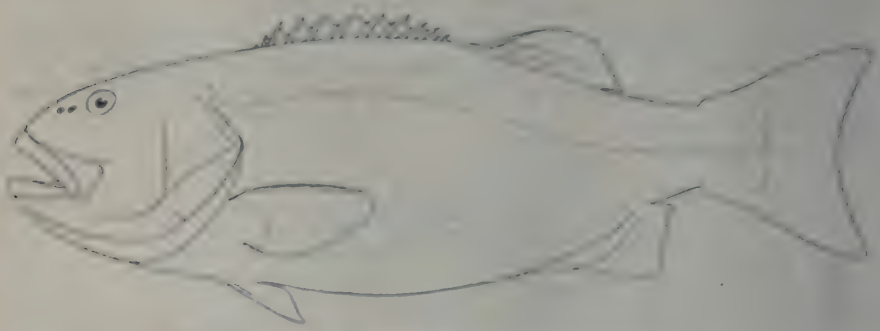

Fig. 23. Black sea bass or jew fish (*Stereolepis gigas*).

This huge fish is rather abundant in southern California, and it is taken as far north as the Farallone Islands. It reaches a length of six feet, or sometimes even more, and a weight of 500 or 600 pounds. A considerable amount of its flesh, cut in large chunks and salted, finds a ready market. Its flesh, however, is not of the best, being rather coarse grained. Those of small or moderate size are said to be better than the large ones. It is a famous fish among the anglers of big game fishes, and monsters of nearly 500 pounds have been taken on tackle unbelievably light. Related to it is a huge jewfish of the south Pacific that is said to reach a length of 12 feet.

The accompanying drawing is a composite reconstructed from several photographs, all of which show the fishes hung by the lower jaw and the head much distorted. The photographs show considerable variation in the depth of the body as compared with the length, and a marked variation in the relationship of the anal fin below the soft dorsal. In some the two fins end evenly behind. In others the anal projects much farther backwards.

Rock Bass or Sand Bass (Paralabrax clathratus).

As in the other members of this family the vomer is rough with small teeth, and the hind part of the upper edge of the maxillary is but little hidden under the preorbital bone just above it. The third dorsal spine is about twice as long as the second and scarcely as long as the fourth. The eye is twice as wide as the bony part of the preorbital space just below it. Small, fine spines are on the edge of the preopercle bone, and a flattened spine is just in front of the soft flap at the edge of the gill cover. It is steel-gray below with the upper part of the side mottled and barred with broad blotches of dark color with silvery gray between. The fins are all tinged with yellow. There are no small, round, dark spots on the head or body. Fig. 24.

Fig. 24. Rock bass or sand bass (*Paralabrax clathratus*).

This bass is an excellent food fish. It reaches a length of 19 or 20 inches and a weight of 5 pounds. It is found from San Francisco southward along the Lower California coast, and is most abundant below the Santa Barbara Channel. This and the other two species of *Paralabrax* are all known as rock bass, kelp bass, and cabrilla without distinguishing between them. I have more or less arbitrarily restricted the use of these names in the hope that the species may be more consistently distinguished from each other by common names.

Kelp Bass or Johnny Verde (Paralabrax nebulifer).

This bass may be known by the small, round, dark spots on the side of the head, particularly below and in front of the eye, and, usually, on the side of the tail just in front of the caudal fin. The teeth on the

vomer and the relative covering of the maxillary by the preorbital is as in the rock bass. The third dorsal spine is considerably more than twice as long as the second and is longer than the fourth. The eye is as wide as the bony part of the preorbital space just below it. The spines on the edge of the preopercle and the flat spine on the gill cover do not differ much from those of the rock bass. The small scales on top of the head extend forward to opposite the front of the eyes. The ground color is solid greenish to under the middle of the second dorsal, behind which the color of the back and side is irregularly broken with short wavy lines. The under parts of the body are pure white. On the front of the body are some traces of irregular dusky bands extending down and back. The first dorsal has a large dusky spot in front, and the anal fin is a bright slate-blue. The cheek and region below the eye are covered with small round golden or yellowish-brown spots. Fig. 25.

Fig. 25. Johnny Verde or kelp bass (*Paralabrax nebulifer*).

This bass is a very good food fish, differing little in this respect from the rock bass and spotted kelp bass. It is rather abundant on the coast of southern California, and has been occasionally taken as far north as Monterey Bay, while southward it extends its range along Lower California. It reaches a length of about 18 inches.

Spotted Kelp Bass or Cabrilla (Paralabrax maculatofasciatus.)

The spotted bass may be at once known by the small spots that everywhere cover the head and body and extend over the second dorsal and caudal fins. In common with the other members of the family Serranidæ the vomer is rough with fine teeth and the maxillary is only slightly hidden by the bones above it. It resembles the kelp bass (*P. nebulifer*) and differs from the rock bass (*P. clathratus*) in having the third dorsal spine longer than the fourth, and the eye as wide as the preorbital space below it. It differs from the kelp bass in color, and in having the fine scales on top of the head not extending forward beyond the middle of the eyes. The color is greenish-brown covered over with small, round, dark brown spots very close together. These extend onto the soft dorsal, caudal and anal fins. On the side of the head the spots are smaller and tinged with golden color. Six or seven dusky bars extend down from the back across the body. On these the

spots are darker and more or less run together. A dusky-bluish streak extends from the eye down and back across the cheek. Fig. 26.

This is one of the very few shore fishes found on our coast that extends its range southward as far as Mazatlan, Mexico. It has not been reported north of the Santa Barbara Channel. It reaches a length of 18 inches and as a food fish ranks with the other two basses of the genus *Paralabrax*.

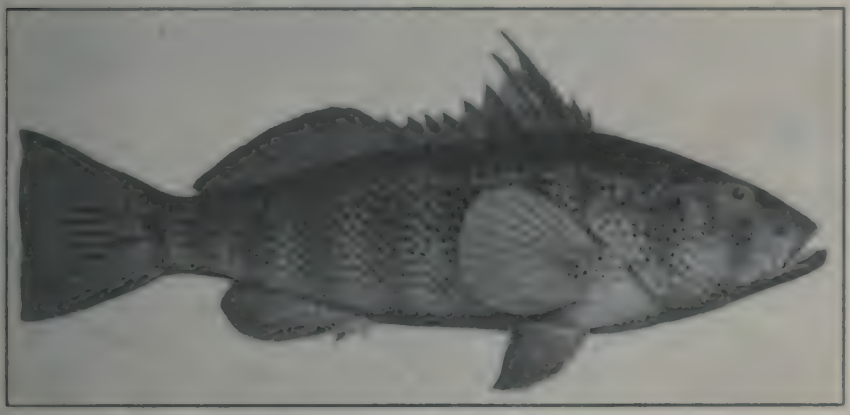

Fig. 26. Spotted kelp bass or cabrilla (*Paralabrax maculatofasciatus*)

FAMILY HÆMULIDÆ

Sargo (Anisotremus davidsoni).

The sargo is a deep bodied fish that may be at once known by the dark band that extends down across the body, and the dark spot on and above the pectoral base. The mouth is small, slightly sloping from the horizontal, armed with fine teeth set in bands, and with thick, fleshy lips. When the mouth is closed the lower jaw scarcely projects beyond the upper. The maxillary, which is considerably covered by the bones above it, scarcely reaches back to under the front of the eye. The edge of the preopercle is armed with small spines. The base of the spinous dorsal is longer than the second dorsal. The dorsals are connected, and the longest spines are longer than the longest rays. The base of the anal is short, or scarcely equal to more than half the distance from the anal to the base of the ventral spine. The caudal is somewhat forked, or deeply concave behind. The pectoral is long and pointed, about as long as the head and reaching well past the tips of the ventrals. Color grayish silvery, dark above with many dark points. A black cross-band extends down from the middle of the spinous dorsal across the side to a point on a level with the pectoral base. The base of the pectoral is black, with the black extending some distance upwards and touching the edge of the gill cover.

This fish ranges from San Pedro southward along the Lower California coast. In the summer time it is reported to be not uncommon about San Diego and the Santa Barbara Islands. It reaches a length of somewhat over a foot.

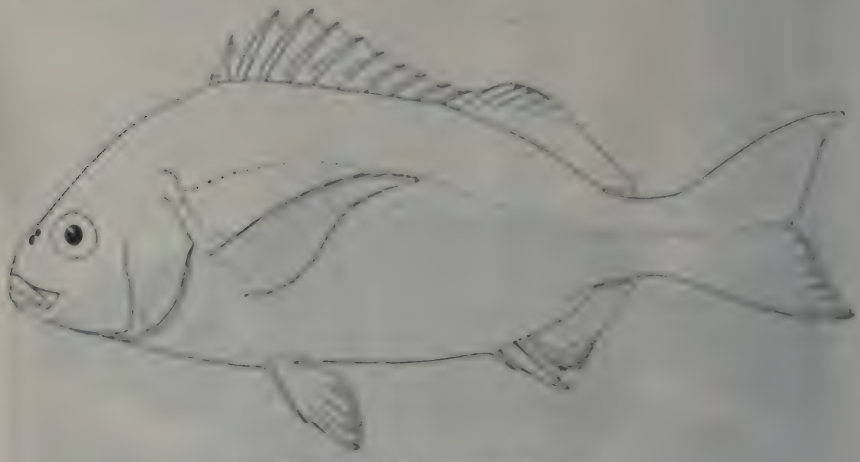

Fig. 27. Sargo (*Anisotremus davidsonii*).

Big-eyed Bass (Xenistius californiensis).

This is not a true bass, but belongs to the related family Haemulidæ. It has no teeth on the vomer, and a considerable portion of the maxillary is covered by the bones just above it. It somewhat resembles the striped bass in the shape of the fins and in having stripes lengthwise of the body, but the stripes are not nearly so conspicuous. The eye is very large; its diameter greater than the space between the eyes on top of the head, and about equal to the distance from its front margin to the tip of the lower jaw when the mouth is closed. The mouth is moderate in size, very oblique, and with the lower jaw projecting beyond it in front. There is no flat spine pointing backwards at the hind angle of the gill cover. The maxillary reaches to opposite the front of the large

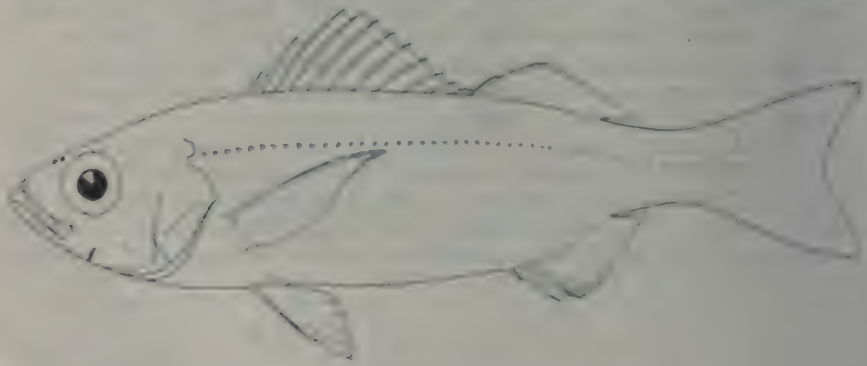

Fig. 28. Big-eyed bass (*Xenistius californiensis*).

pupil. Fine spines are around the edge of the preoperele. The pectoral is pointed and extends farther back than the ventral fins. The first dorsal is rather triangular in shape, almost separated from the second dorsal, and is composed of rather stiff spines. The second dorsal resembles the anal fin. The scales feel very rough when the finger is passed over them in the direction of the head. The color is bright silvery, bluish above. Six or seven dark orange-brown stripes run lengthwise of the body.

The big-eyed bass reaches a length of about a foot, and is found from southern California southward along the Lower California coast. It is reported to be sometimes common about San Diego.

FAMILY KYPHOSIDÆ.

Greenfish or Opal Eye (Girella nigricans).

The greenfish has a bluntly rounded head and a moderately deep body. Small teeth are in bands on the jaws, attached to the membrane only and freely movable. Examination with a magnifier will show that each tooth is divided into three points. The maxillary is entirely hidden under the bones above it, leaving only the premaxillary in sight when the mouth is closed. The maxillary scarcely reaches to below the front

Fig. 29. Greenfish or opal eye (*Girella nigricans*).

of the eye. The edge of the preoperele is not divided into fine spines, and behind it the gill cover is devoid of scales. The spinous dorsal is much longer than the soft dorsal and broadly attached to it. The spines do not decrease much in length towards the last ones, and the longest ones are about as long as the longest rays. The rays of the anal fin are about as long as the base of that fin. The pectoral is short and rounded, nearly as long as the head, and scarcely reaching as far back as the tips of the ventrals. The caudal fin is slightly concave. The color is olive-green, paler on lower parts, the fins dusky greenish. Small ones have a yellowish spot on the back, and the fins have bright blue borders. The blue color quickly fades when the fish dies. The eye is a beautiful opal blue and green, hence the name, opal eye, that is sometimes applied to it. It is also called blackfish and blue-eyed perch.

The former name should be discouraged as it is not related to the famous bluefish, and the latter is doubly unfortunate, for it is neither a perch nor related to the fishes on our coast that we wrongly call perches. The name was doubtless given it from a fancied resemblance to the false perches, but aside from the shape of the body, it has nothing in common with them.

Though the greenfish is herbivorous, feeding very largely on sea weed, it will bite a hook baited with a bit of clam or abalone. It scarcely exceeds a foot in length, and when fresh is a food fish of very good quality, but its flesh is rather soft and does not keep well. It is found in abundance from San Francisco southward to the coast of Lower California. Small ones are very abundant in tide pools.

Half Moon (Medialuna californiensis).

The half moon is a compressed deep bodied fish that may be known from its relatives on our coast by the complete covering of fine scales that extends over the anal and second dorsal fins, and to a less extent over the caudal. The mouth is small, slightly oblique, and armed with fine even teeth set in broad bands. The maxillary scarcely reaches back to below the front of the eye. The lower jaw scarcely projects

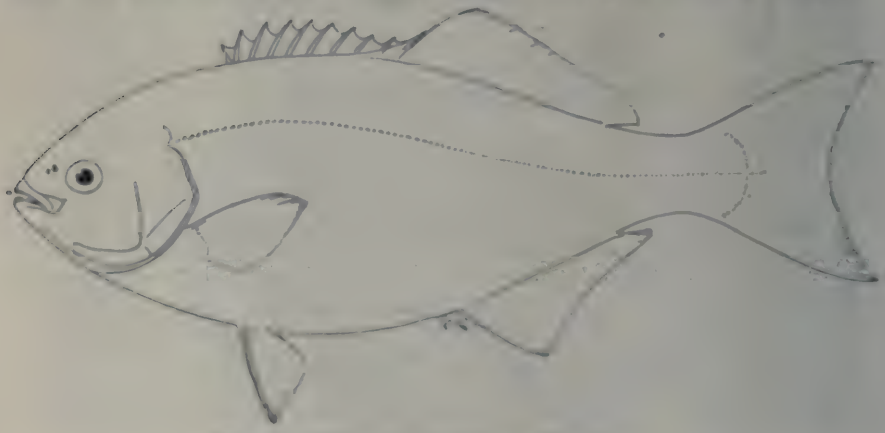

Fig. 30. Half moon (*Medialuna californiensis*).

beyond the upper when the mouth is closed. The edge of the preopercle is thin, membranous, and not divided into fine sharp points. The first dorsal is connected with the second and is very much lower, the longest spines being little longer than the diameter of the eye. The anal is shorter than the soft dorsal but resembles it in shape, being highest in front, where it rises to an angle and sharp pointed behind at the tip of the last ray. The caudal is evenly concave behind. The pectoral is rounded, much shorter than the head, and not reaching nearly so far back as the tips of the ventrals. The color is dark steely gray, lighter below, and more or less mottled, all of the fins are dark, and the dorsal and anal nearly black.

This fish is very beautiful in its lines and color. It is taken in considerable abundance about rocky places on the southern California coast, and is reported to be a very good pan fish. It reaches a length of about a foot.

BEAR HUNTING WITH BOWS AND ARROWS.

By SAXTON POPE.

For some years back a number of us in San Francisco have been hunting with the bow and arrow, purely for sport. A powerful bow is an effective weapon, but it takes months of practice to be able to shoot it well. Such a bow pulls 75 pounds.

Having killed rabbits, quail, squirrels, bobcats, skunks, foxes, and deer, we naturally wanted to try our hand on a bear. We knew that a bear is a hard animal to kill even with a gun, but we also knew that the Indians killed him with a bow. So we wanted to find out just how much there was to the game. Our friends of course were very skeptical. They said that an arrow would hardly go through his hide.

Fig. 31. Black bear killed with bows and arrows by Arthur Young and Saxton Pope of San Francisco in Panthen Canyon, Humboldt County, California.

We got in communication with Thomas Murphy of Blocksburg, Humboldt County, who hunts bear as a business. He has been at this sort of thing for thirty years and never fails to get about a dozen bear every winter. So we packed up our strongest bows and several dozen broadhead arrows, and Arthur Young and I went up to Blocksburg.

Murphy was willing to let us shoot at a bear, but he insisted upon carrying a gun in case of accidents. He said he didn't want to lose a valuable dog over the affair.

After four unsuccessful hunts, we at last treed a good-sized bear up a tall fir. After securing the dogs, Mr. Young and I took our stand about thirty yards from the base of the tree, on the sidehill, and let drive two arrows at one time. Both shafts struck the bear in the chest, going completely through, feathers and all.

Quick as a flash the bear wheeled about and began descending the tree. We ran up close and shot him again as he neared the ground, and bounded down the hill. Murphy turned the dogs loose, and they all went crashing through the brush together.

Pretty soon we heard them bay him again, and we rushed a quarter of a mile down the canyon to find him sitting on the limb of another fir, holding on like a man. We shot again and he dropped to the ground, where the dogs heeled him and went flying past hanging on to a hind leg. The bear immediately mounted a nearby oak, not over eight inches in diameter, and swung out on a limb. At close range, we shot arrow after arrow through his chest while he slipped further out on the bending limb, and at last fell to the ground, rolling over and over down the canyon. The dogs were on him in a second, and by the time we reached the creek bed, the bear was dead.

Murphy performed the autopsy, giving the hounds the liver and lights. Eleven arrows had gone through the beast, seven of these through the chest. The lungs were collapsed and pulmonary hemorrhage finished him. The first two shots would have been enough if we had waited.

It was a three year old female black bear, weighing about 150 pounds. That it was no larger was no fault of ours. The arrows cut ribs in two at several points and undoubtedly could have penetrated any beast with a hide less resistant than a hippo or an elephant.

NOTES ON THE ARTIFICIAL PROPAGATION OF THE SPINY LOBSTER.

By P. S. BARNHART, Scripps Institution for Biological Research.

Because of its possible bearing on the future artificial propagation of the spiny lobster, *Panulirus interruptus*, I think it might be worth while to make a record of the conditions under which eggs were hatched and the young carried through the phyllosome stage of development.

It has always been easy to secure berried lobsters and obtain from them the first stage of the young. These have always died before passing through further stages of development, even though kept in fresh running sea water, supposedly under ideal conditions.

B. M. Allen working under the auspices of the California Fish and Game Commission in 1911, constructed elaborate hatching boxes at the inlet to False Bay, where a plentiful supply of fresh water was constantly available and the water in the boxes kept in constant agitation by means of a rotating wheel. In his published notes (1916) he says: "There is no difficulty in securing the young. It is only necessary to impound spawn-bearing females. The young hatch very readily even after the spawn-bearing parent has been kept in captivity for weeks. Attempts to rear them, however, proved futile. Their extreme delicacy and pelagic habit make their culture an especially difficult problem."

On May 14, 1918, a berried lobster was placed in a large concrete tank, 6 by 9 feet, in the research aquarium of the Scripps Institution. This tank contained approximately 800 gallons of water. A small jet furnished about 5 gallons of water an hour. The 20th of June two green turtles weighing about 30 pounds each were placed in the same tank. Every few days after this quantities of a green alga was thrown in for the turtles to feed upon. Much of this rotted and accumulated in

one corner of the tank under and around a lot of large stones where the lobster kept itself hidden.

The in- and outflow from the tank was not enough to keep the water perfectely fresh and it began to take on the milkly hue indicative of bad water. This finally became so bad that I decided to clean the tank out. On the 10th of July I started to do this, but where the sun struck the water I noticed that there was a slight movement on the surface as of many small animals moving about. I immediately made a haul with a fine net and was much surprised to find quantities of phyllosomes. Many of these were put into fresh running water where they remained alive for several days, but gradually died off. Those remaining in the large tank kept alive about eight days when they also died. As far as I was able to observe these were in the small, first phyllosome stage.

This experiment might indicate that, while bearing and hatching the eggs, the adult seeks comparatively quiet water where there is much decaying vegetation. It surely proves that fresh clean water is not necessary for their hatching and development to the phyllosome stage. Allen found that spawn-bearing females usually "seek sheltered spots in the lea of islands or points of land and take refuge in sheltered crevices of rocks alongshore."

I hope to repeat this experiment this year on a much larger scale.

IS THE HERRING GULL INSECTIVOROUS?

By A. C. BURRILL, Idaho Station Entomologist's Office.

Some individuals doubt that gulls naturally eat insects. They consider that the blowflies reported eaten by gulls (Dr. Dutcher, President of National Association of Audubon Societies), were merely gulped down when some gull seized a beached fish on which the flies might have been ovipositing. This seems probable and also that some other insects eaten, as the white grub's adults, the May beetle, may have been washed up on shore alongside fish and so included with the bigger mouthful, even if the young gulls were being fed by their mothers at the time. (By the Wayside, Feb., 1912, p. 42.)

In The Auk (v. 19, p. 46), Doctor Dutcher saw at the No Man's Land Gull Reservation, Maine, young gulls which, as soon as able to leave the rookery, went in flocks to neighboring grass and potato fields and ate immense numbers of grasshoppers and potato beetles. This doesn't look like mere beach scavenging, does it? Yet I agree that many insects can be easily swallowed unintentionally by scavenging gulls. In the summer of 1910, I related in a recent note how the gulls cleaned up the fish driven ashore on Lake Michigan, Whitefish Bay, Wisconsin. At that time there were thousands of beetles, largely ladybirds (Coccinellids) of many kinds, along the beach, besides various other unfortunates, so that a gull would have great difficulty in cleaning a fish body of all of the smaller fry before swallowing.

Owing to the lack of material, former Chief Henshaw says, our Federal Biological Survey has made very few stomach analyses of this species. But just lately Dr. A. S. Alexander called to my attention a Scottish work (Transactions of the Highland and Agricultural Society of Scotland) in which in 1912 is given the analysis of 612 Scottish gull

stomachs, including 44 herring gulls (the same as ours, *Larus argentatus* Gmel.). This seems to accord so well with the little known here that I venture to quote in the words of the author, Miss Laura Florence, Carnegie Scholar in the University of Aberdeen, published at Edinburgh: "*Summary*: 15 contained fish; 3, carrion; 13, shells; 4, refuse; 1, brittle star; 4, crustacea; 3, insects of injurious group; 2, insects of indifferent group; 3, earthworms; 3, potatoes; 9, grain; 14, grass; 9, seeds." Again, she lists the food for a single male shot at Donmouth in Aberdeen, Oct. 31, 1910: "Stomach about quarter full; fragments and husks of grain; fragments of chitin; forceps of an earwig (Forficuliadæ); grass." The chitin mentioned may have been other parts of the same earwig or some other insect. This work was supervised by the well-known zoologists, Professors J. Arthur Thompson and J. W. H. Trail.

Fig. 32. Herring gulls on breeding grounds, No Man's Land, North Carolina. Photograph by Herbert A. Job.

Thirty per cent of these gulls, therefore, ate fish, but the amount of fish material must have been much less than that. Compare Mr. Henshaw's statement regarding American gulls: "The herring gull can be considered a fish eater only to a very limited extent. Occasionally, we have found the remains of fish in the stomach contents, but there has always been collateral evidence that the fish were eaten in the shape of offal. When about harbors and inland waters, its principal food consists of garbage. We have a number of stomachs collected in Maine by Dutcher, and these contain the remains of June bugs and other insects with about 10 per cent of fish garbage, showing that the herring gull is in some localities and to some extent, at least, insectivorous."

In Leslie's Weekly, for Sept. 5, 1912, there is a view of the American battleship "Utah," near Galveston, Texas, surrounded by sea gulls

picking up refuse. In an earlier issue, February, 1909, is another of gulls picking up fish from a school of herring on the high sea. This is more often true of the kittiwake gull or of the stormy petrel, alias "Mother Carey's Chicken," well shown in Collier's Weekly for Sept. 6, 1913 (p. 15), though Mabel Osgood Wright says the name herring gull was given this bird "because as they were originally fishermen by trade, their presence flying above the water told where schools of herring were to be found. Today the schools of herring are less plentiful along our shores, and the value of this gull, though greater than ever, is due to a different source." Now gulls act as seavengers, becoming "the health officers of the coast" (November, 1907, The Herring or Harbor Gull, Educ. Leaflet No. 29. The Nat. Ass. And. Soc., N. Y. City).

Mr Braun (By the Wayside, January, 1912), claims gulls still dive for fish occasionally in Green Bay, Wisconsin, but Mr Henshaw rather disputes this for the United States as a whole, and so writes friend W. T. Davis, a careful observer and naturalist of Staten Island, New York Harbor (letter, Dec. 31, 1912). One of the best refutations of much fish being eaten by gulls came out in the Pall Mall Gazette (Feb. 6, 1912), Mr. F. G. Aflalo saying:

Fig. 33. Sea gulls flying over headlands, La Valle, California. Photograph by L. Hasse

"The public mind is constantly being misled on this subject of the destructiveness of gulls by journalists with a passion for statistics. Only the other day a morning paper published what purported to be the pretermal menu of a sea gull during the year. It was shown in terms of a great line of barrels of herrings, 146 barrels, each containing 500 herrings, to a total not far short of 200 pounds sterling. There were two very obvious fallacies in this reckoning. In the first place it assumed that the whole of the 73,000 herrings thus consumed as fry, would have grown to maturity if the gull had left them alone. To put it mildly, this is by no means proved; to put it frankly, it is rubbish.

Moreover, this imposing cartoon gave no hint of the tons of offal and garbage which, to the great benefit of many a harbor, these feathered scavengers consume every year. The picture told, in fact, what was not true, and suppressed what was."

Mr. C. W. Creel, in charge of the cereal and forage insect investigations laboratory of the United States Bureau of Entomology, at Forest Grove, Oregon, informs that often, when the farmers are plowing in the Salt Lake Valley, Utah, gulls come in large flocks to work over the land, whether after insects or field rodents would be a very interesting line of investigation. Likewise we have a photograph of many gulls visiting plowed land in California, and suppose that this is the California gull. However, it will be interesting to hear from other observers, if the herring gull, which is less common there than in other parts of America and Europe, still shows sufficient interest in plowed fields in California to associate with the California gulls in their field patrols.

One species of gull flies up the Columbia River and has been reported in spring as far up the Snake River Canyon as Lewiston, Idaho, per Adjutant General Charles Moody, showing that even inland Idaho, though lacking large lakes, may be within the flying zone of this valuable species. In the Big Bend country of eastern Washington, some of the farmers who were worried by the large armies of coulee crickets in the spring of 1918, were discussing if there would be any advantage in shipping a few pairs of gulls to the desert country to eat up these crickets and thus attract more gulls to fly in from the coast, and thus repeat the well known tale of the Mormons and the Mormon crickets of Utah, and the deliverance effected by the gulls. Further data is invited.

Messrs. B. G. Thompson and M. M. Reeher, special field agents of Mr. Creel's office, have furnished the following details. Mr. Thompson was sent into the grasshopper afflicted district near Burns, Harney County, Oregon, May, 1918, where he met a Mr. McGee who said that for several years gulls had been working on grasshoppers. Messrs. Thompson and McGee went out to look for a new band of hoppers in May and after a long hunt saw at a distance about a thousand gulls feeding on the land. Mr. McGee felt sure that they would find the hoppers near there, and on going over to see, found the gulls so gorged that they would hardly get out of the way. The gulls were busily picking up the young hoppers. Mr. Reeher was sent into Langells' Valley, near Klamath Falls, Oregon, early in June, 1918. His guide told him that a few gulls visited the hoppers the year before, and showed him this June, 1918, about five hundred gulls feeding on hoppers. We have no data as to what species of gull this was, save that it was white with bluish slate-colored wings, which answers to at least three species. As the California and ring-billed gulls breed in colonies on Klamath Lake, it seems reasonable to believe that birds of these two species were implicated.

These facts are given to show that gulls may be quite as well worth study in the West as in the East, and their protection quite as necessary.

FRANK A. SHEBLEY.

The death of Frank A. Shebley, one of the oldest employees of the Fish and Game Commission, which occurred in a hospital in Yreka, December 21, 1918, came as a profound shock to scores of friends. Although he had been unconscious for seven hours after the accident to the auto bus in which he was riding between Fort Jones and Yreka, several days before, on Saturday morning there was every indication that he would get well, but a sudden change which occurred late in the afternoon ended in death.

Frank Shebley was born in Nevada county nearly forty-seven years ago. He was the son of California's first famous fish culturist, and had succeeded before his death in company with his brother, William H. Shebley, in making a reputation as great if not greater in the same line of endeavor than that of the father who had gone before. As a boy, he followed farming on his father's place, but for the past twenty-five years has been identified exclusively with fish culture in connection with the California Fish and Game Commission, and there are few men on the Pacific slope who knew as much about fish and fishing in the waters of the rivers and bays as Frank Shebley knew. During his experience with the Commission he was the superintendent of the Price Creek hatchery in Humboldt county, and the Brookdale hatchery in Santa Cruz county, and recently the new Mount Whitney hatchery in Inyo county. Under his management the Brookdale hatchery became very popular and was sought out by sportsmen from all over California as a place of great interest. Also interested in angling as a sport, he was a master of the fly rod and a skilled angler. In recent years he had given some attention to land investments, as well as mining ventures, and with W. P. Netherton of Santa Cruz was the owner of considerable property in Texas.

Few employees of the Fish and Game Commission have been so universally loved as has Frank Shebley. His genial personality and perpetual good humor won for him hosts of friends. His loss will, therefore, be a personal one to many. Mr. Shebley's technical attainments furnish assurance that the vacancy left by his death will be hard to fill.

CALIFORNIA FISH AND GAME

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All material for publication should be sent to H. C. Bryant, Museum of Vertebrate Zoology, Berkeley, Cal.

April 21, 1919.

"Conservation deals with those things to which practically every normal person turns for relaxation in his moments of leisure."

OUR MAILING LIST.

The mailing list for CALIFORNIA FISH AND GAME has been entirely revised. Those who did not take the trouble to sign the card enclosed in the October number have been removed from the list and a new written request alone will replace them.

There have been so many additions to our mailing list of late that the edition published has had to be increased. This, in connection with a marked increase in cost of printing, leads us to speculate as to the possibility of continuing free distribution. It may well be that some small charge will have to be made for the magazine in the future. If this change becomes necessary, we will but be following the lead of several other states. A regular subscription list would allow a great saving in postage in that the magazine could then be mailed as second-class matter.

PENDING LEGISLATION.

Less important fish and game legislation has come before the present legislature than for many years past. The bills that have been introduced are less radical in nature and notably less in number. The few relating to game which stand out as desirable are: A bill granting discretionary powers to the Fish and Game Commission which would allow better administration of fish and game resources; bills making the state laws conform with the new federal regulations; and one remodeling the districting act to include two new game refuges, an area in the vicinity of Mt. Breckenridge, Kern County, and an area on Mt. Hamilton, Santa Clara County.

Desirable changes in the law requiring fishways are provided for in two bills, and it is hoped that another bill prohibiting fishing within two hundred and fifty feet of any fishway or screen will be passed. An important bill provides for the inspection of all imported fish eggs or fish so that undesirables may be quarantined.

Among undesirable bills relating to game are those which provide bounties on predatory birds and on predatory mammals, one opening the bear season in districts 2, 2A and 10, one opening the season on rabbits in the above districts, one providing for the repeal of the hunting license law, and one providing for the sale of ducks killed when destroying rice. A bill to permit the use of a spear in taking trout in certain local districts and a pernicious shrimp bill are among those relating to fish which would tear down present protective laws.

It seems reasonable to believe that our legislators will look with disapproval on those bills which are adverse to the best interests of our fish and game, and will stand by those tending to uphold protection and conservation for our wild life resources.

FISH AND GAME COMMISSION INAUGURATES EDUCATIONAL WORK AT SUMMER RESORTS.

Believing that a better knowledge of wild life will bring about better conservation of it, and that when people are on their summer vacations they are most responsive to education on wild life resources, the California Fish and Game Commission, backed by the Nature Study League, will institute this coming summer a series of lectures and nature study field trips designed to stimulate interest in the proper conservation of natural resources. The Tahoe region has been selected for the work this year. The work will be offered at six different resorts. The month of July is the time set. All lectures and classes will be open

to the public and no fees will be charged. Illustrated lectures on the game birds, song birds, mammals and fish will furnish evening entertainment, and early morning trips afield will give vacationists an introduction to mountain wild life.

Everyone wants to recognize the plants and wild things encountered on the summer vacation. There is no better way of developing this ability than to accompany one who knows the trees, birds and mammals. Special attention will be given the identification of birds by call, song, color and habits. The motto of these classes will be: "Learn to read a roadside as one reads a book." Knowledge of wild life insures better conservation of it. Special excursions for children will be conducted.

These nature study lectures and field trips which compose the vacation camp work of the Bureau of Education, Publicity, and Research of the California Fish and Game Commission are designed to bring about a healthy interest in the out-of-doors and in wild things that through knowledge proper public sentiment and proper conservation of our natural resources may be brought about. In other words, "conservation through education" is the end being sought.

PRESERVE GAME RESOURCES.

California's natural resources in fish and game, with its incomparable climate, its 26,212 miles of fishing streams, its 982,000 acres of lakes and every stage of climatic conditions to be found out of doors, are a gigantic magnet drawing people from remote corners of the earth. California should be the mecca for the human race. The remarkable development of road building of the past few years, with the development of the automobile, have brought the people in touch with this wonderful fish and game asset.

To hunt and fish is as natural to the California boy and girl as to breathe. The farmer and land owner is practically the breeder and raiser of our game and he is ever zealous in its protection. His children hunt and fish whenever the season and opportunity offer. Not a family exists in our rural districts that does not own, as a family heirloom, a shotgun or a rifle, and both sexes of the children are taught their use. They can teach many an expert the fine art of angling in the stream that flows by his home.

There in the rural districts you will find the nucleus of the strong, virile generation that Northern Europe knows so well and that will come after us, for they live much in the open, where they learn self-reliance. Let us not remove from them the natural opportunity to improve their physical being, but rather assist them by conserving our natural resources in fish and game.

Continued changing and revising the fish and game laws will do more toward decimating our fish and game than all the hunters and fishermen can possibly do. The State Fish and Game Commission is a state body directing and supervising the entire work of fish and game protection, propagation, distribution and conservation. Thus the state is administered as a unit and a maximum degree of protection can be given. This could not become an actual possibility were each of the fifty-eight counties given full and complete control within their respective borders. With fifty-eight separate and distinct districts, ranging from a mere handful of population to half a million, each endeavoring to handle the affairs of each for themselves and not one for the other, one can easily imagine the chaotic state of affairs that would result. Thus one can realize why experimental legislation would be and is more detrimental to the unsurpassed fish and game interests of California than all her hunters and fishermen, alien and domestic.—Editorial, Sacramento *Union*, Feb. 16, 1919.

LARGE PROFITS WITH SLIGHT OUTLAY.

Few, if any, natural resources of a state are administered with so slight a cost to taxpayers as is fish and game. Wild birds, mammals and fish yield a splendid annual return in food and sport, to say nothing of their help in controlling pests, and this wild life does not need food or shelter, but simply reasonable protection. Not one dollar is appropriated by the state for its maintenance. The small burden falls entirely upon those who make most use of the resource. The hunters and anglers of this state by paying a small license fee of $1.00 furnish

the funds used to enforce fish and game laws and initiate protective measures. Many persons are ignorant of these facts and these are the ones that continually complain of the high cost of fish and game administration.

"NOW BEGINS THE SEASON."

"Now begins the season of the year when the weary city man turns his face from the familiar crowds and noises of the city to the country places: where he may fish in the trout streams; plod over the hills with a gun on his shoulder in the hope of shooting something; dabble in the ocean waves at the beaches; or sleep all night on the hard ground, with queer noises going on in the woods around him, curious little insects walking over his body and tickling him, curious little animals tiptoeing around among the leaves, and unknown dangers, remembered from his primitive days, waiting to catch him and gobble him up."—San Francisco *Bulletin*, June 30, 1914.

It is good for a man to wander back at intervals into the domain of old Dame Nature. What good does it do? It means quickened pulse, hearty appetite, an inexpressible tingle of exhilaration in every nerve, better poise, greater resiliency of step, augmented power of body and mind for the battles of the workaday world.

What element is more important in making insistent the call to marsh, field, and mountain than that furnished by the wild life? Exterminate the game and you make the world drearier, more monotonous, less interesting. Exterminate California's game and you turn one of the most attractive of the sisterhood of states into a desolate waste.—*Western Wild Life Call*, No. 4.

CONVICTION MADE UNDER FEDERAL MIGRATORY BIRD TREATY ACT.

Los Banos and other San Joaquin points have heretofore supplied most of the ducks for the market. Changed conditions have moved the activities of market hunters to Colusa, Sutter and Yuba counties. The city of Colusa, being in the center of operations, became the rendezvous of most of the market hunters. The fact that the Migratory Bird Treaty Act prohibits the sale of all waterfowl made no difference to these men who shoot for money.

The difficulty of detecting sale transactions is evidenced by the following facts. One of the most notorious hunters maintained a joint in Colusa where ducks were dispensed after the password had been given. So notorious had the place become for the distribution of ducks that traveling men had no difficulty in purchasing them at any time. It was the custom of these men to keep a supply of ducks on hand in order that they might guarantee the limit to so-called city "sportsmen" whom these hunters took out at so much per day. The surplus ducks were shipped to San Francisco and Sacramento under fictitious names to be distributed by agents.

The proprietor of this joint, with three other well-known market hunters, was detected on October 15, 1918, the day previous to the opening of the season, with 226 ducks and one snipe in his possession. Information was filed against these four defendants, Charles Guernsey, J. T. Maley, Frank Chambers, and Joe P. Meyers. They were indicted by the Federal Grand Jury and were tried by jury on February 4, 1919, at Sacramento, Judge Van Fleet presiding. The jury returned a verdict of guilty in eleven minutes, and the defendants were sentenced to pay $100 each or in default serve 60 days in jail.

Much credit is due state and federal wardens Carpenter and Ludlum, Deputy United States Game Warden E. S. Cattron and Assistant United States Attorney Johnson for the manner in which the case was handled. As this was the first case in California under the Migratory Bird Treaty Act, Judge Van Fleet did not impose a maximum fine, but warned all future offenders to beware.

GEO. NEALE.

MENDOCINO RANCHER MAKES GOOD KILL.

Mr. Frank Williams, a sheep rancher of Calpella, Mendocino County, recently succeeded in killing a black bear which had been killing sheep in the vicinity for several years. It weighed 300 pounds. A mountain lion was killed the same day. (See Fig. 32.) During the winter of 1913 seven lions were killed in this vicinity.

Fig. 34. Mountain lion and large black bear which had pestered sheepmen for years at last rounded up in one day by Frank Williams, a rancher of [illegible], California. Photograph by Una Boyle.

GAME LAWS TO BE ENFORCED IN NATIONAL FORESTS.

Persons who violate the state game law on national forests now become liable to prosecution in the federal courts. A regulation recently issued by the Secretary of Agriculture is as follows:

"The going or being upon any land of the United States, or in or on the waters thereof, within a National Forest, with intent to hunt, catch, trap, willfully disturb or kill any kind of game animal, game or non-game bird, or fish, or to take the eggs of any such bird, in violation of the laws of the state in which such land or waters are situated, is hereby prohibited."

BEAVER HIDES CONFISCATED.

Deputies Newsome and Sellmer, while on patrol work along the Tuolumne River, discovered 14 green beaver hides in the camp of a trapper. The trapper, fearing the hand of the law, had fled. If the attempts being made to locate the trapper are successful, prosecution will follow.

DEPUTY ACQUITTED AT TRIAL.

Deputy Carpenter of Maxwell, Colusa County, was recently made defendant in a suit to compel payment for seventy-three ducks which he seized from three Colusa market hunters. The commission's attorney, R. D. Duke, handled the case in a masterly way when it came to trial by jury at Colusa on February 11. Attorney Duke contended that the justice had no jurisdiction in the case and that it should be tried by a federal court, but he was overruled by Justice of the Peace, Moore. Nevertheless, the outcome was a verdict in Deputy Carpenter's favor. This vindication of the game laws by a jury in Colusa augurs well for the future.

WAR-TIME SAVING IN COST OF FISH FOOD.

The furnishing of proper food to the millions of fish reared in our hatcheries is no small problem. Until the cost made it prohibitive, beef liver was largely

used in the preparation of fish food. With the increase of cost wholesale in San Francisco from 5 cents to 12 cents per pound, it became necessary to seek a substitute. This was found in refuse fish costing but 4 cents per pound. A product of a fish reduction plant known as cracklings has been found usable, but hardly as satisfactory as beef liver.

THE PACIFIC COAST WHALE INDUSTRY.

It is reported that in 1918 the principal whaling company on the Pacific Coast, with stations in Washington, British Columbia and Alaska, took 900 whales, of which about 200 were of the set species (*Balaenoptera borealis*), whose meat is light colored and particularly good for canning. One right whale was captured; it yielded 1,600 pounds of excellent baleen. Four samples of this baleen, 8 to 9 feet in length, have been sent to the bureau for exhibition purposes. The short baleen of the common shore whales, which in recent years has been thrown away, now has a fair market value, and large quantities of the discarded material are being profitably salvaged.—*Fisheries Service Bulletin*, No. 45.

FOOD ADMINISTRATION REGULATIONS ON FISHING NO LONGER EFFECTIVE.

All of the rulings of the Federal Food Administrator regarding the commercial fisheries of the state, with the exception of that relating to the packing of sardines, were revoked on December 31, 1918. The laws of this state are now in full force and effect as they were previous to the rulings of the Food Administrator.

MORE BIRD TREATIES NEEDED.

Conservationists having successfully provided for the protection of migratory wild fowl which breed to the north of the United States are now demanding a similar protection for the waterfowl and insectivorous birds which summer in the United States, but spend the winter season in Latin America, where they are wantonly slaughtered. As a sample of the type of destruction which goes on in Mexico, we quote from a letter written by H. S. Battie of Hollywood, California:

"Regarding the market shooting, I refer solely to ducks, except the egret, no other feathered game is shot for the market.

"As you may not have heard of the methods of shooting ducks for market, I will explain it.

"In the table lands of Central Mexico nearly all the large haciendas have ponds or lakes to catch water during the rainy season which is later used for irrigation. During the winter the ducks congregate in immense numbers on such places.

"At a convenient place on the bank a frame of heavy timbers is laid, and to these are fastened batteries of guns—anything that will shoot, in some cases iron pipe being used. They sometimes have three tiers, five shoot, one above the other, and perhaps a hundred or more guns, the first aimed at the water, the second slightly above, and the third slightly higher still. These are fired by trains of powder.

"On the day selected the peons go in boats, and also wading, gradually driving all the ducks on the lake into a compact mass in front of the battery. At a signal the boats back away and the peons duck under. The first tier is fired as the birds are sitting and the other two a fraction of a second later as the birds are taking wing. The slaughter is dreadful. I would not care to say just the number, but an American friend who happened to be at an hacienda at the time, told me they got two thousand that day. I had no reason to think he exaggerated."

While interest is still strong regarding the protection for migratory and insectivorous birds effort should be made to give the summer visitant class of birds equal protection with the winter visitants. Not only will the carrying out of such a program of protection be a benefit to the citizens of today, but will be a benefaction to the coming generations.

CONSERVATION OF FISH.

Former visitors to Santa Catalina Island, who remember seeing tons of albacore, tuna, and black sea bass spoil on the pier and then towed out to sea, will be interested in reading the report of the Avalon Fish Exchange. All fish caught by anglers and not utilized by them becomes the property of the Fish Exchange. This supply is augmented by market fishermen. Last season 165,000 pounds of edible fish were shipped to the mainland. This was in addition to the large amount sold on the island. Included in the shipments to the mainland were 92 giant bass, fish which formerly went to waste, but which now are in great demand. Anglers trolling in Catalina waters used

15,000 flying fish as bait. Valuable data as to the time of year when the different varieties of fish are in abundance is being accumulated by the exchange.

DEPENDABLE INFORMATION IS NEEDED.

Honorable George D. Pratt, Conservation Commissioner of the state of New York, has recently called attention to the need for precise and dependable information about wild life resources. He points out that the underlying cause for the multiplicity of laws relating to game offered at each session of the different state legislatures is inadequate information regarding game conditions. In attempting to fill this need, Mr. Pratt instituted in 1915 a game census designed to furnish a running check upon the condition of the state's wild life. By leaving out of consideration unprovable assertions or estimates based upon guesswork or the unreliable method of averaging, the census gives definite knowledge regarding general abundance of different species in different sections and the fluctuations in their condition from season to season. Each of the 140 field men have been required to report upon cards every week all of the game that they have seen and the conditions under which that game was existing during that week.

On the deer card, spaces are provided for recording the number of bucks, does, and fawns, damage to crops, distribution, physical condition and food supply. Other cards provide for data regarding game birds and waterfowl, fur-bearing animals, and predatory animals and birds, with appropriate remarks. As a result of a study of the deer cards, it has been possible to draw definite conclusions regarding relative proportion of the sexes and the extent to which they are breeding.

As a means of gathering additional statistics, every holder of a hunting license when applying for a new license will hereafter be required to give in addition to his name, residence, personal appearance, etc., the amount of game that he killed under his old license. This will give an approximate measure of the amount of game actually killed and will give a basis for demonstrable facts. With these facts at hand, wise laws can be maintained on the statute books, and changes will be brought about only as rapidly as actual changes in the condition of wild life justify modification of the law.

When Vermont inaugurated the same system it was pointed out that the value of such a census would be threefold:

1. The warden force will be educated in local conditions and brought into closer harmony with the sportsmen.

2. A basis for wise legislation will be secured for the protection and conservation of a resource of real value in terms of dollars and cents.

3. The educational value to our people as increasing their interest in, and cooperation with, the work of the Department of Fisheries and Game.

STATE GAME DISTRICT 1K.

In connection with the Sequoia Park extension bill introduced in the present session of Congress, which proposes to extend the present boundaries of the Sequoia National Park to include the South and Middle Fork canyons of the Kings, it is worth while, perhaps, to consider the effect that the passing of this bill would have on the game situation in the Sierra and Sequoia National forests, and particularly on the State Game Refuge 1K between the north and middle forks of the Kings.

Nearly one-third of the area of Game District 1K is within the boundaries of the proposed park extension, and as other areas suitable for the propagation of game are also included, and the park regulations do not permit hunting within the national parks, it is only reasonable to suppose that some action may be taken to try to have the present game district abolished, on the grounds that the park will amply provide for all the game protection needed in this part of the mountains.

The fact will still remain, however, that no other area is so favorably situated with regard to ideal conditions for winter breeding grounds as the low brushy southern exposures in township 12 south, range 28 east afford. Because of the rough nature of the country and its inaccessibility, there is little probability of attempted poaching, and while a park would provide protection and ample range during the summer season, I believe it would be a serious mistake if the above-men-

tioned township at least is not retained as a game preserve where hunting is prevented at all seasons.

It might be argued that the closed season during the winter months offers all the protection that is necessary; but it would be found, I believe, if the game preserve were abolished, that a large number of hunters would flock to this area in the open season, on the assumption that by this time the deer would be working down from the higher elevations where they had been protected in the park and possibly tamed to some extent.

One other consideration is the open bear season of November and December that offers a legitimate excuse for hunting parties in the brush at that time of year. That is the one time when poaching might be carried on, for only a few hunters could resist the temptation to kill some of the numerous bucks they would undoubtedly see, especially since the chances of detection are so small without the continuous presence of a game warden in the vicinity. It would seem much safer to cut out every excuse for legitimate hunting in these breeding grounds.

ROY BOOTHE.

IS THE PORCUPINE WORTH SAVING?

Evidence that we have not yet standardized our game laws is apparant in the different viewpoints taken by the states of New York and Minnesota regarding the porcupine. The New York Conservation Commission classifies the porcupine as "vermin" and enumerates twenty as having been killed during January, 1919. The state of Minnesota, on the other hand, protects the porcupine on the theory that the animal furnishes an easily obtainable source of food to anyone lost in the wilds.

MANICURE THE BIRD-CATCHING CAT.

Dr. Wm. H. Dall, of the United States National Museum, recently pointed out a method that will save our cats and thoroughly protect the birds against their attacks. It is a well-known fact that these animals only seize their prey through the use of the claws on the forefeet. These claws are, as we know, so organized anatomically that when at rest they are retracted, but when brought into play they are thrown forward, so that their sharp points may be instantly employed in the act of seizure. No cat ever attempts to catch a wild bird in the open by employing its hind feet, or the claws upon them. No lion, tiger, leopard, or any of the rest of the big felines in nature ever do. This also holds in the case of pet cats who kill the canary in its cage, or capture the fish in the globe or aquarium.

When one comes to think this over, it soon becomes clear that, were cats deprived of their claws on their forefeet, they could not catch a bird of any kind, however hard they tried. The claws have no more feeling in them than have our finger-nails, to which they really correspond. Cat claws can be trimmed just as we trim our nails, and the best tool to do it with is the small cutting pliers used by jewelers. Anyone can use such a tool, and with a little practice anyone owning a pet cat can readily trim all the claws on its forefeet. All there is to be done is to gently press the foot from above, downwards, between your thumb and forefinger, when the claws will be thrown forward. They should be snipped off a trifle back of their middles applying the cutting edges of the nippers to their sides. A little dressing with delicate file afterwards will also prove advantageous. A cat so operated upon can not possibly catch and kill a wild bird or a pet bird in a cage; nor can it destroy fish in any receptacle in which we may keep them. Moreover a cat with its claws so trimmed can not climb a tree; it is up in trees that they catch many birds, as they likewise do by running up poles topped with bird boxes and bird houses of every description. After the claws are trimmed the foot looks precisely as it did before the trimming was performed—that is to say, nothing unsightly results.

Some will say that it prevents the cat from catching mice. Well, what of it? There is not one cat in a hundred that catches mice for any purpose; moreover, a few mousetraps of modern models will very quickly rid house, barn, and outhouses of all description of mice. Any of the "cyclone" pattern of traps will do it in a few weeks. Cats with trimmed claws can enjoy their milk and other food just as well as with untrimmed ones, so there is no cruelty done along such lines.

Finally, were we to trim the claws in the manner indicated of all claimed cats, and destroy all cats not claimed by anyone we would save thousands of insectivorous birds annually; and surely the country has by this time begun to realize what the insectivorous birds mean to the farm and agriculturist generally. A federal law should be enacted to enforce what is indicated in this matter, and be so framed that, when passed, it would be in the highest degree effective.—*Ill. Audubon Soc. Bull.*, 1918.

A PLAN TO CONSERVE WYOMING ELK.

After a very careful investigation of the problems presented by the herds of elk on the National Forests adjacent to the Yellowstone National Park, Henry S. Graves, chief forester, and E. W. Nelson, chief of the Bureau of Biological Survey, have suggested a plan, based on sound biological principles, for conserving this valuable game animal. They propose the maintenance of the present herds, estimated to number from 40,000 to 45,000 and the use of the annual increase for legitimate hunting and distribution to build up other herds. The maintenance of these herds is to be accomplished by the acquisition by purchase or exchange of private land to provide needed additional winter forage, and the setting aside of adjoining areas as game refuges, the progressive extinguishment of sheep grazing privileges to prevent any possible conflict between wild life and domestic stock, the enlargement of the present government ranch in Jackson Valley to provide forage during severe seasons, a vigorous campaign against predatory animals that destroy elk, and state legislation requiring hunters to report the number and kind of animals killed and to preserve and make economic use of the meat. In addition, it is proposed that a special study of the migratory drift and winter and summer habits of the elk to supply certain facts now in doubt should be instituted.

FUR FARMING IN ALASKA.

The United States Bureau of Fisheries in a recent bulletin (Document 847) gives interesting information regarding fur farming in Alaska. Reports are given on the success obtained in no less than 25 different breeders. Fur farming in Alaska is concerned almost wholly with the breeding and rearing of foxes, but some attention has been given to minks and martens, and there are records of martens having been born and reared in captivity in the territory. Although skunks and raccoons have been introduced into Southeastern Alaska, nothing is known as to the success attained.

The history of fur farming in southeastern Alaska is with but few exceptions a history of failures rather than successes. Three good reasons for the failures can be advanced: one, neglect due to irresponsible men left in charge; two, discouragement following failure of the industry to prove a "get-rich-quick" proposition; three, lack of experience and knowledge in handling fur animals. Nevertheless, the opportunities for the fur farmer in Alaska are almost unlimited.

HOW DO BIRDS FIND THEIR WAY?

A lecturer at the California Academy of Sciences on January 15 discoursed on "How Migrating Birds Find Their Way." This lecturer upset all my previous notions that instinct had anything to do in guiding birds on long journeys, and gave numerous instances to prove that birds followed previously observed currents of air and water in their flight, or rose and depended upon sighting distant landmarks through their well-known powerful vision.

As a lover of birds and a former breeder of homing pigeons (usually called carrier pigeons) my observation leads me to believe that the orienting instinct of birds is innate, on the same principle that, biologically, plant and animal life is governed by the influences of light and heat. I cite a case in our late war of bird travel under difficulties. A Lake County man began to raise homers (carriers) for the United States Army in France. Anxious to try out his stock he sent a male fledgling to my home at 1125 Bush street, San Francisco, in a little collar box with a few holes perforated in the cardboard. Wheat lay on the bottom of the box, but the bird was cramped and did not eat it on the rough stage trip from the mountains. When it arrived, it had nothing in its crop and it should have been nurtured, but next day it was taken from the dark box, a quill fastened to its leg

with date, hour, and minute, and released. It barely made the fire wall of the five-story apartment house next door, and sat stretching one leg and wing, then the other, preened its feathers, lifted its head to one side, then the other, rose, circled a few times and darted north. Being of good homing stock, I thought we should hear from it next day, but three weeks passed, then came word that the bird had got home, worn, bedraggled, with a .22 bullet wound through its breast and wing, over which the blood and feathers had matted or had been stuffed in the wounds by the bill of the bird. The wounds were weeks old.

Now, how did the bird exist, and how did it find its way—a young bird, its first flight after a seventy-five mile trip in a dark box, from which it never gleaned sight of a landmark to guide it home to the Switzerland of America if not by some inherent trait? Can CALIFORNIA FISH AND GAME readers elucidate?—JOHN OLIVER TITLOW.

A SUGGESTION FOR CALIFORNIA CONSERVATIONISTS.

It may be of interest to those concerned with the conservation of wild life in California to note that the state of New York number of game and fur-bearing animals ing of additional information as to the number of game- and fur-bearing animals killed in that state. The *American Field* for December 28, 1918, page 593, states that:

"Beginning January 1 all applicants for hunting and trapping licenses in New York State will be required to make a statement of the game and fur-bearing animals which they took under their license for the previous year if they had one.

This information will be tabulated on the stubs of the licenses, which are retained by the town and village clerks and will give to the Conservation Commission accurate information of the greatest value regarding the food and game resources of the state.

Statements of their 1918 catch, which sportsmen make when securing their 1919 licenses, will necessarily be from memory, but to assist them in keeping track of what they take during 1919 a neat little tally card will be supplied when the licenses are taken out, upon which the sportsmen can keep a record during the year.

Both license and tally card will be handed to the applicant in a stout manila envelope, in which he may carry them in the field and keep them clean throughout the year."

It is believed that this suggestion will appeal strongly to Californians. As the tendency toward reduction in the numbers of game and fur-bearing mammals becomes more noticeable, it is fortunate that public opinion is insisting more and more upon scientific administration of the fish and game resources of the state. It is evident that a common sense program of this sort is dependent upon adequate information, and it seems that the method suggested is one which gives promise of valuable results. The writer has been advised by Dr. T. S. Palmer that the method has been given a partial trial by one or two of the provinces of Canada and a similar number of states. The chief difficulty in regard to it is in connection with enforcement. Changes in residence and failure to appreciate the necessity for definiteness in the record are among the complicating factors. It is believed, however, that the adoption of a measure of this sort would be a long step in the right direction. In California this would be particularly true with reference to the fur-bearing mammals, concerning the numbers of which taken during any one season adequate information is not available.—WALTER P. TAYLOR, Biological Survey, Washington, D. C.

THE GAME BIRDS OF CALIFORNIA.

The Game Birds of California (Contribution from the University of California Museum of Vertebrate Zoology) by Joseph Grinnell, Harold Child Bryant, and Tracy Irwin Storer: University of California Press, Berkeley, 1918. Large 8vo., pp. x 642. 16 colored pls., 94 figs. in text. Cloth, $6.00 net.

The volume of the above title is the comprehensive book on the game birds of California that sportsmen, nature lovers, and serious students of bird-life have long needed. The book aims to supply the naturalist with complete information to date regarding the life histories of California birds, to give the hunter useful facts concerning the birds he wishes to shoot, to furnish the legislator with helpful suggestions relevant to the preparation of game laws, and to give the conservationist information which will aid

him in his efforts to perpetuate bird life. The authors took into account all four of these classes of readers and selected and arranged their material accordingly.

Every one of the 108 native game birds of the state is described in detail, these including the ducks, geese, swans, ibises, cranes, rails, snipe, sandpipers, curlew, plover, quail, grouse, pigeons and doves. The localities in which each is found, and the times of the year when it is found, are designated and its life history and habits are accurately described.

The extensive collections and field notes in the California Museum of Vertebrate Zoology, supplemented by previously published knowledge from the experience of ornithologists throughout the West, have formed the basis for the volume. To this groundwork has been added material obtained from interviews with numerous reliable sportsmen and directly from the fresh field experiences of the authors themselves. The whole is worked into what constitutes a practically complete summary of our knowledge of each of the species down to date. The authors do not claim that the book contains everything that ought to be known about each of the game birds of California; far from it, for more extended observations are certain to provide multitudes of new facts. This book should act as a stimulus for future observers, leading them to add to what is now made common knowledge regarding our game birds.

The joint authorship of the book is the working out of the principle that the highest plane of scientific output is likely to be reached only through co-operative effort. When one author works alone, mistakes are made unawares, but when two, or better three, are at work, one is able to check another's work to advantage, and an increased measure of accuracy is the result.

An underlying incentive for the publication of the present work was found in the decrease of many valuable species of game birds and the apparent apathy of the public with reference to instituting proper measures to conserve them. The book adequately treats of the means to be taken to conserve game and makes practical recommendations suited to each species.

Introductory chapters are devoted to general subjects, as follows: Decrease of Game and its Causes; Natural Enemies of Game Birds; The Gun Club in California; History of Attempts to Introduce Non-native Game Birds; The Propagation of Game Birds; Legislation Relating to Game Birds in California. The sportsman and nature lover will find much of immediate utility in these general chapters.

The technical matter useful to the special student of birds is found condensed in small type at the head of each discussion. This makes reference to the finer characters of each species easy, and at the same time segregates this formal matter from the more readable text following.

The plan of treatment of each bird follows a regular sequence: Technical portion (in small type): Accepted common and scientific names; other names; description: adult male, adult female, juvenile, downy young; marks for field identification; voice; nest; eggs; general distribution; distribution in California. Text (in large type): General and local distribution; migration; field marks; life history: nest, eggs, young; habits and behavior; food; economic value; present and probable future status.

"The Game Birds of California" is well illustrated with line drawings and colored plates. Thirteen of the sixteen colored plates were made by the well-known artist, Louis Agassiz Fuertes, and the other three by Major Allan Brooks, now of the Canadian army. In all, twenty-one different game birds are figured in color. The 94 line drawings serve largely to illustrate characters of plumage, bill, or feet, such as are especially helpful in identifying the different kinds of game birds.

As a sample of what may be expected in the treatment of each species, attention may be called to the chapter on the Valley Quail. Twenty-three pages are utilized in describing the bird, its nest, eggs, distribution, field marks, habits and behavior. Here will be found interesting evidence to show that the male birds act as sentinels. A compilation of data on time of nesting and size of clutch occupies over four pages. It is demonstrated that the valley quail lays more eggs than any other game bird, and under normal conditions suffers corresponding mortality.

Means of controlling this mortality are suggested. A discussion of the agricultural bearing, early hunting for the market, and present and probable status of this upland game bird concludes the chapter.

All through the book especial attention is given to those distinctive characters of a bird that help to make it recognizable from other species when alive, at a distance. A useful field manual is thereby provided. A dependable key to the various species makes possible the identification of any specimen in hand. The index contains all the common as well as the scientific names, thus making it easy to locate any bird, provided some name is known, even though this name be a very local, popular one.

Every school and library in the western states should contain a copy of this work for reference use, for more and more is the natural history of bird life assuming importance as a subject of general popular culture. Individuals interested in the fascinating field treated in this work should waste no time in securing copies.

PASSENGER PIGEONS REPORTED IN EASTERN STATES.

Apparently the death on September 1, 1914, of Martha, a twenty-nine year old passenger pigeon kept in captivity in the Cincinnati Zoological Gardens, marked the extinction of the passenger pigeon. At least for several seasons thereafter, a prize offered for the discovery of a passenger pigeon's inhabited nest failed to disclose any pigeons.

During 1918, however, several persons reported seeing passenger pigeons. Baymen and oystermen of Great South Bay insist that a few pigeons still migrate along the southern shore of Long Island, New York.

According to a letter published in SCIENCE, Messrs. Rasmussen, Wilson and Sanders, of Amsterdam, New York, encountered a flock of passenger pigeons on October 1, 1918, while on a bird-study trip in the vicinity of West Galway and Charlton, New York. One of the birds lighted within a few feet of the party, and Mr. Rasmussen, who has been studying birds for 25 years, declares that there is no possible doubt of the identification.

The latest report is from John M. Crumpton, 61 years of age, and Superintendent of the Connecticut State Board of Fisheries and Game. He describes having seen three passenger pigeons in the middle of May, 1918, while fishing at Grannis Pond, Southington, Connecticut. He maintains that he had no difficulty in identifying them, for he has been acquainted with the appearance and habits of the passenger pigeon since early boyhood, having been 13 years old when he first shot passenger pigeons, and having had a trained passenger pigeon for a pet for a long time. On June 2, 1918, a Mr. Wooster, who was told of the find, saw three birds, and on June 9, a Mr. Parker saw two birds in the same vicinity.

ENGLISH GAME BIRDS VINDICATED.

Recent investigations of the food of the English pheasant, the red grouse and the partridge of England show that these splendid game birds do not appreciably damage growing crops.* The stomach examination of 183 stomachs of pheasants show that their food consists largely of injurious insects and weeds. This conclusion is of particular interest when it is known that the Board of Agriculture and Fisheries on February 8, 1917, authorized the War Agricultural Executive Committee of each county to reduce the stock of pheasants on any land "where there is a risk of substantial injury therefrom to crops." The only possible harm occasioned by the pheasant for which there seems to be any reliable evidence is that of tramping down corn, and this is not of frequent occurrence, but happens only where birds are unusually abundant.

The food of the young red grouse is made up largely of insects, while that of the adult is largely browse secured from heather and twenty or thirty other plants. So far as agriculture is concerned, the partridge is a harmless bird. The percentage of cereals consumed is small and restricted to a very short season of the year. This is secured largely in stubblefields.

In conclusion, it is pointed out that blame for crop destruction should be fixed upon

*Collinge, W. E., On the food and feeding habits of British game birds. Reprint from [illegible] Agricc. Soc. June, 1917, pp. 1-8.

the eight species and that the wood pigeon, rook, certain species of gull and the starling have been proved guilty. If birds of the above character are destroyed wholesale the farmer is being robbed of a species that are beneficial, and the real culprits as well as the injurious insects eaten by the game birds, are left to continue their work of destruction of the country's food supply.

THE GROUND SQUIRRELS OF CALIFORNIA.

Anyone interested in the life history or the control of the ground squirrel should obtain a copy of the November-December number of the Monthly Bulletin of the State Horticultural Commission which is available free of charge. This bulletin contains thoroughly up-to-date and unquestionably authoritative information on the ground squirrels of California and their control, compiled by leading state and federal investigators. In the leading article each of the 18 different varieties of ground squirrels known to inhabit the state are treated, and nine of these are figured in color. It is pointed out that only four of these varieties are of special economic importance.

THE FOOD OF MALLARD DUCKS.

A recent bulletin (No. 720) of the United States Department of Agriculture treats of the food habits of the mallard ducks of the United States. Mr. W. L. McAtee, the author, devotes eight pages to an enumeration of the different kinds of food taken by the mallard, the information being based on the examination of 1725 gizzards. The enormous quantities of seeds taken by the mallard duck is evidenced by two stomachs. One contained about 28,160 seeds of a bulrush, 8700 of a sedge, 35,840 of primrose willow, and 2500 duck weeds, a total of more than 75,200. Another stomach contained no fewer than 102,400 seeds of primrose willow besides a number of other items in smaller numbers. "The seeds in this stomach if sowed one in a place and a foot apart each way would suffice for two and one-half acres of ground."

About one-tenth of the food of the mallard is derived from the animal kingdom and nine-tenths from the vegetable. A large proportion of the vegetable food is made up of the seeds of sedges with those of grasses ranking next in importance. About 2.34 per cent of the food of the birds examined was made up of acorns. The animal food consists of mollusks, insects, fishes and crustaceans in order of importance.

Such a detailed report of the food of one of our best game birds is not only valuable in proving the economic status of the bird itself, but should be of help in providing attractive food for wild birds and suitable food for mallards on the game farm.

WILD BIRDS AND LEGISLATION.

Apparently other countries than the United States have suffered from the result of hasty and ill-considered legislation relative to wild birds. In a recent paper by Doctor Collinge, the foremost economic ornithologist of Great Britain, he points out some of the more important statutes passed by Parliament and their ultimate effects upon wild bird life.* The dominant idea throughout early acts of Parliament seems to have been that birds must be reserved and preserved for the king and his retinue, or such favored individuals to whom he pleased to grant licenses.

Practically all of the acts are characterized by selfishness and an utter disregard of the interests of agriculture or horticulture. Among the curious acts are one making it a felony, punishable by death, for a person to wrongfully take the eggs of any "falcon, goshawk, or lanner, or the birds of any falcon, goshawk, or lanner or lanneret," and one providing that "any person who shall take or attempt to take any wild bird by means of a hook or other similar instrument shall be guilty of an offense."

In the summary Dr. Collinge states that a dispassionate and unprejudiced consideration of the facts leads to the following conclusions:

1. That in the past the question of wild bird protection and destruction has never received really serious consideration. The objects sought in most of the acts of Parliament upon the subject have been largely of a selfish nature and not for the good of the country.

*Wild Birds and Legislation, by Walter E. Collinge. Jour. Land Agents Soc., 1917, pp.

2. That the majority of these acts have been ill-considered and often hastily prepared; many of them have been repealed and others frequently amended or modified.

3. That no attempt has been made by those who advocate the protection of wild birds, to understand the problem presented by wild bird life. Blindly, and often strongly prejudiced, they advocate protection for all birds, and protection only.

4. That such an attitude is calling forth a deep resentment from those who have to live by the products of the soil, many of whom having waited in vain for repressive measures, *have now taken to destroying wholesale all bird life.*

5. *That the irresponsible advocacy of uniform protection is indirectly contributing more than anything else to the wanton destruction of many of our most useful birds.* "Some of the very greatest friends that our nation has are being destroyed without mercy * * * a defensive force upon which most of our prosperity depends."

6. That the immediate need of the present is for a wide and comprehensive act that will give protection to all non-injurous or beneficial birds, and provide adequate repressive measures for those species which have become too numerous and destructive.

The same condition seems to exist almost everywhere. Realization of the chaotic condition of the game laws due to hasty, ill-considered and constantly changing legislation is not lacking, but the initiative to clean things up and to base game legislation on scientific fact rather than on selfish motive rarely exists.

H. C. BRYANT.

FLY LARVAE SUCK BLOOD OF NESTLING BIRDS.

A recent publication of the University of California points out that the nestlings of many of our common song-birds are infested with the larvæ of a fly which sucks the blood.* The fly which is responsible is very much like the common housefly, but is of a metallic blue color. This fly lays its eggs in a newly-occupied nest, and soon the larvae which hatch from the eggs attach themselves to the young birds. Deserted nests usually contain the pupæ. Among the common birds whose nests and nestlings were found infested were the Nuttall sparrow, California purple finch, California linnet, green-backed goldfinch, willow goldfinch, and the California brown towhee. The author of the paper concludes that from 5 to 10 per cent of the parasitized nestlings die from loss of blood.

This discovery doubtless helps to explain the mortality among nestling birds so often noted in the bay region.

IMPORTATION OF QUAIL FROM MEXICO.

The joint regulations governing the importation of quail from Mexico, issued by the Treasury Department and the Department of Agriculture under date of November 13, 1916, were in full force and effect the past season, the entry of quail being permitted from February 15 to April 10, inclusive, and on March 8, 1918, Laredo, Texas, was designated as a port of entry in addition to Eagle Pass, Texas, and New York City. Cooperation was continued with the Bureau of Animal Industry in having a thorough inspection of the birds made during the ten days' quarantine.

The first permit was issued February 20, 1918, and the last, April 4. The number of quail for which permits were issued was 10,500, and the number released from quarantine only 5,205, as compared with permits issued for 42,973, and the release of 32,814 in 1917.

The notably large decrease in the number of quail actually imported during the past year is accounted for by the scarcity of birds in northern Mexico due to drought, and the refusal of large ranch owners to permit the trapping of quail on property owned and controlled by them. Also it is evident that state game officials were reluctant the past year to purchase Mexican quail for propagation because of the severe losses of birds imported during the season of 1917.

Of the 5,205 birds actually released from quarantine only 16 were found dead during the ten days quarantine period, and no case of quail disease was discovered. So far as reports received by the department indicate, there were few losses of birds in shipping. The change of dates

*Plath, O. E., A muscid larva of the San Francisco Bay region which sucks the blood of nestling birds. Univ. of Calif. Publ. Zool., 19, 191-200.

for the importation of Mexican quail—beginning at a later period, February 15, instead of in the fall, as in 1916—has proved beneficial by preventing the birds from reaching the northern states during severe winter weather.—Report of Chief of Bureau of Biological Survey, 1918, p. 17.

FEDERAL MIGRATORY BIRD LAW.

Owing to the prevention of spring shooting during the last few years, under the federal migratory bird law, a great increase in migratory wild fowl has been reported practically throughout the entire United States. The reports state that more birds were killed during the fall of 1917 than in any similar season for many years. With the need of increasing food resources, this increase in game birds, as a result of a federal conservation law, was a practical and opportune return. Continued protection of our wild fowl during the spring will unquestionably continue to increase the returns in food and sport from this source each year.

For administrative purposes under the migratory bird law the United States is divided into 13 districts, under the supervision of 12 inspectors, who, with the assistance of 182 federal wardens, enforce the regulations, in the various states. During the year the commissions of 47 federal wardens were terminated and 49 new wardens were appointed.

The inspectors and federal wardens reported 313 violations of the regulations, which with those of previous years make a total of 1,132 cases on file. All but 29 of these cases, which have been disposed of in court, have been withheld pending the decision of the United States Supreme Court in the case of the *United States* v. *Shauver*, involving the constitutionality of the law. Defects in the law, particularly in that it did not make the possession of birds during the closed season unlawful, and did not confer on inspectors and wardens the power of arrest and search, made it possible for many violators to escape. A further difficulty in enforcement was encountered in the limited number of inspectors, each with an unduly large district. Reports, however, show that violations were more sporadic and fewer birds were killed unlawfully than in previous years.

Voluminous information has been received from state game commissions and others showing that there is an ever-increasing number of waterfowl and shorebirds in most of the states; furthermore, that wild fowl have become unusually tame in spring because they are not molested at that season; and that many thousands are breeding in localities where they had not nested for many years.

The consensus of opinion attributes these greatly improved conditions to the general observance of the federal prohibition against spring shooting which has been brought about through the good will of sportsmen and by the increased activities of this bureau, with closer cooperation of state game authorities.

The friendly attitude of the state game commissions toward the federal migratory bird law has been shown in many ways, particularly in their initiative whereby the state and federal regulations have been brought into harmony. Twenty-three states now have laws making the open seasons on migratory wild fowl similar to those under the federal regulations. Amendments of the regulations were promulgated October 15, 1917, which assisted in unifying federal and state game laws, thus simplifying their administration.

A bill to give effect to the treaty between the United States and Great Britain for the protection of birds which migrate between this country and Canada passed the Senate July 30, 1917. The Senate bill, with amendments, passed the House June 6, 1918, and was then referred to a conference committee. The conference report was adopted by the House June 28, and by the Senate June 29, and the bill was signed by the President and became effective July 3, 1918. Nation-wide interest was manifested in the passage of this legislation, which was secured through the united efforts of state game commissions, sportsmen, farmers, and others interested in the conservation of wild life. The new law contains many excellent provisions necessary for its effective enforcement, and it will be possible to obtain much more satisfactory results under it than have been possible under the original migratory bird law. Canada has already passed an enabling act and promulgated regulations for enforcing the terms of the treaty.—Report of Chief of Bureau of Biological Survey, 1918, pp. 17–19.

LONG RUN OF A TAGGED SALMON.

The United States Bureau of Fisheries has received from John P. Babcock, of the Fisheries Department of British Columbia, record of the capture in the upper Fraser River of a sockeye salmon bearing on its tail a button that had been inserted in marking experiments carried on by the bureau on Puget Sound.

The fish, dip-netted by an Indian at Soda Creek Canyon, British Columbia, on August 16, 1918, had been taken at Village Point, Lummi Island, Washington, on July 19, 1918. Soda Creek is approximately 400 miles from the mouth of the Fraser River, and Village Point is about 70 miles from the same place. Therefore, assuming that the fish moved by the most direct route, the average rate of travel was nearly 17 miles a day.

NIGHT HERONS GAME IN LOUISIANA.

California was for some time noted as the only state in the Union which permitted the hunting of ibis. Louisiana now holds the distinction of being the only state where the night heron is considered a game bird. According to the 1916-18 Biennial Report of the Department of Conservation of Louisiana, the night heron is often utilized as food and the law provides for an open season from November 1 to February 15 with a bag limit of 15 birds. Both the black-crowned night heron and the yellow-crowned are found in the state, and both are popularly known as "Gros-becs." The young while in immature plumage are particularly sought after by hunters and that is why when served *sautes a l'oignon* it is considered a dish "fit for the gods."

CALIFORNIA TROUT.

What kind of a trout did I catch last summer?

An answer to this and like questions will be found in the July number of CALIFORNIA FISH AND GAME which will be a TROUT NUMBER. The colored plates will make identification of trout easy. Watch for the TROUT NUMBER.

FACTS OF CURRENT INTEREST.

The first case made under the Federal Migratory Bird Treaty Act resulted in the conviction of four violators and a sentence of $100.00 fine or 60 days imprisonment.

The work of the deputies in the duck country has been greatly simplified the past year. Fear of the federal law has resulted in few violations.

Whistling swans were abundant in western Stanislaus and Merced counties during the latter part of the open season, but left about the first of February. Several parties who could not forego the excitement of taking a shot at these beautiful birds were apprehended by deputies, and severely fined.

The Sacramento Orphanage and Farm, the Sacramento County Hospital, and the Registrar of Charities, have recently been the recipients of 631 ducks confiscated by deputies during the open season on waterfowl.

The attempt of market hunters to make shipments of ducks to parties in San Francisco whom the shippers did not know was frustrated by deputies of the commission. The old stunt of shipping under fictitious names is not so easily worked as it once was.

Ring-necked pheasants have become so numerous in Inyo County that residents are demanding an open season.

Large catches of herring have been made this spring and this fish has been selling as low as four cents a pound, retail. Even at this price the demand is not sufficient to prevent tons of herring going to the fertilizer works.

The new hatchery on Fall Creek, a tributary of the Klamath River, has been turned over to the Fish and Game Commission by the California-Oregon Power Company and it is now in full operation.

J. C. Bruce of Wawona, who was recently appointed state mountain lion hunter, killed three of the animals on his first day's hunt in Tuolumne County. Mr. Bruce made his record near South Fork Camp and was assisted by his trained varmint dogs. He will remain in Tuolumne County a month and then go to Shasta County to continue the work.

The salmon catch in 1918 was unusually large, exceeding 12,800,000 pounds.

HATCHERY NOTES.

W. H. SHEBLEY, Editor.

Mount Shasta Hatchery.

Approximately ten million quinnat salmon eggs have been shipped to the Mount Shasta Hatchery from the United States Bureau of Fisheries station on the Sacramento River tributaries and from the Klamath River Station, which was operated this year by the California Fish and Game Commission. The eggs have all been hatched out and the fry will be distributed in the upper reaches of the Sacramento and Klamath rivers as soon as they are of suitable size. A considerable number will be held in the three large salmon-rearing ponds at the hatchery over the summer months, and released after the first fall rains.

Loch Leven and eastern brook trout egg collecting operations at the Mount Shasta Hatchery were very successful this season. There are 1,300,000 eastern brook and 3,000,000 Loch Leven eggs and fry on hand at the station at this date.

The rainbow egg-collecting season is a little late this year, there being only 60,000 eggs of this species on hand at the hatchery on March 1.

Mount Whitney Hatchery.

A supply of eastern brook and Loch Leven trout eggs have been shipped from the Mount Shasta Hatchery to the Mount Whitney Hatchery and the fry resulting will be reared and distributed, together with the other species of trout fry handled at this hatchery this season, in the waters of southern California, Tulare and Kern counties.

Work on the improvement of the grounds at the Mount Whitney Hatchery is progressing nicely, much of the preliminary grading and filling-in work having been completed.

Mount Tallac Hatchery.

Arrangements are being made to open the Mount Tallac Hatchery about the middle of March, and an effort will be made to take the usual number of black-spotted trout eggs this season.

Fort Seward Hatchery.

Quinnat salmon eggs to the number of 1,000,000 have been shipped to the Fort Seward Hatchery, and the fry are being reared for distribution in the Eel River and tributaries, Mad River, and tributaries of Humboldt Bay. The usual number of steelhead trout eggs will be shipped to Fort Seward Hatchery this season for distribution in streams of the north coast counties.

Almanor Hatchery.

Egg-collecting operations at the Almanor Hatchery were commenced the middle of February. The run of rainbow trout in that section is late this season, and to date no eggs have been taken.

Domingo Springs Hatchery.

This hatchery will be opened up the middle of March and it is expected that the usual take of rainbow trout eggs will be obtained from this station.

Snow Mountain Hatchery.

On February 1 a crew was sent to open up the Snow Mountain Egg-collecting Station and Ukiah Hatchery. Practically all the eggs taken this season at Snow Mountain will be transported by auto truck to Ukiah and "eyed" at that station, as there are better facilities for handling the work at the latter place.

Bear Lake Hatchery.

Arrangements are being made to open up the Bear Lake Hatchery during the fore part of March, and the crew is all ready to proceed as soon as it is possible to get into Big Bear Valley.

Brookdale Hatchery.

Egg-collecting operations were commenced at the Scott Creek Station during the fore part of February, and while the run is a little late, as in other sections of the state, nearly a half million steelhead trout eggs have been taken to date. They are being immediately transported to the Brookdale Hatchery, where they are being "eyed." The usual number of trout fry will be hatched at Brookdale Hatchery for distribution in the streams of Santa Cruz and Santa Clara counties. An additional supply of trout fry will be retained at the Brookdale Hatchery and held in the rearing ponds for distribution during the late summer months in the streams of San Mateo and Marin counties.

Fall Creek Hatchery.

Fall Creek Hatchery, which was constructed by the California-Oregon Power Company, and turned over to the California Fish and Game Commission in lieu of the construction of a fish ladder over the Copco Dam, is in active operation at the present time.

Egg-collecting operations at the auxiliary stations located on Bogus Creek and Camp Creek were commenced during the middle of February, and to date a total of 600,000 eggs have been taken.

A little over a million quinnat salmon eggs were shipped to the Fall Creek Hatchery from the Mount Shasta Hatchery, and the fry resulting from this shipment will be reared and planted in the Klamath River as soon as they have reached the proper age.

Yosemite Experimental Hatchery.

Troughs and fishcultural paraphernalia have been constructed for the Yosemite Experimental Hatchery and plans made to operate early this spring to determine the suitability of the water for hatchery purposes on a large scale in the Yosemite Valley.

Fish Distribution.

In preparation for the season's fish distribution work, Fish Distribution Car No. 01 has been placed in the car shops at Sacramento for extensive repairs. Arrangements are being made for a very early distribution of trout fry this season.

COMMERCIAL FISHERY NOTES.

N. B. SCOFIELD, Editor.

Biological Stations Want Protection.

Much of our dependable information regarding marine life comes as the result of carefully planned experiments at the various biological stations along the coast. Oftentimes marine plants or animals are taken from their native habitat and planted near the station where they can be watched and studied. Valuable experiments which have been started have sometimes been made worthless because of the removal of specimens by thoughtless people. To avoid recurrences of this kind the various stations are asking for a law prohibiting the catching or removing of marine plants or animals within one mile of any marine biological station. In view of the facts as stated above such a law seems reasonable.

Fig. 28. Unloading sardines at Monterey, California. Photograph by Carroll.

Proposed Change of Shrimp Law Would Menace Fish Life.

Attempts are again being made to modify the present shrimp law to allow shrimp fishing in the northern part of San Francisco Bay. Shrimp fishing is now limited to the south bay in order to prevent the destruction of valuable food fish. In order that the Fish and Game Commission might be in possession of facts to oppose the change several hauls of a shrimp net have been made near McNear's Point. Many young striped bass and other young fishes were taken in the hauls and these will be preserved in the form of evidence.

Launch "Albacore" Attempts to Aid Fishermen.

Canneries at San Diego, although well supplied with large sardines, have been short of small-sized ones, which are in great demand. The Fish and Game Commission launch "Albacore" recently spent some time attempting to locate schools of small sardines. The launch had little better success than the regular fishing boats. Where the small fish are located is still a mystery.

New Cannery Established at Ensenada.

The Mexican Industrial Development Company is building a new cannery at Ensenada, Mexico. This company plans to can albacore, crawfish, turtle, and tuna. They will also ship fresh fish to San Diego.

Japanese Trawler in Nets of Law.

One of the first arrests for dragging trawl nets within the three-mile limit that has been made since the good administration's rulings lapsed at the first of the year was recently made in southern California by Deputy H. B. Nelson. Although the Japanese crew aboard the fishing boat "California" of San Pedro cut away their net on finding that they were pursued, they were, nevertheless, rounded up. After a three and a half hour search the specially-designed salvaging gear of the launch recovered the abandoned trawl net. Evidence of the destructive feature of the trawl net was apparent in the large number of fish of many different varieties found in the net. It is because of the large hauls possible with such a net that its use is prohibited in shallow waters.

NOTES FROM THE LONG BEACH LABORATORY.

By WILL F. THOMPSON and ELMER HIGGINS.

Among the rare fish which have come into the laboratory and have not been recorded in "CALIFORNIA FISH AND GAME," is a specimen of what we may term "square-tail" for lack of a common name. It is scientifically known as *Tetragonurus cuvieri* Risso. The individual is mounted, fourteen and a half inches long, and somewhat badly preserved because of frequent handling. The exact locality can not be discovered, the fisherman who owns the fish having forgotten it, but it was near Catalina. This is the first record of the species in the North Pacific. It was taken two years ago or more.

It is characterized by two sharp ridges on each side of the tail, which is deeply forked. These ridges are formed by the hard, rough scales, and appear capable of giving a severe injury. The scales over the whole body are very hard, with fine striations on them, and seem to be fastened together in oblique lines running across the body, so that one might be able to tear them off in strips. The mouth is small, and the fins feeble in appearance, while the teeth show plainly that the species is not capable of attacking large prey, for they are small and comb-like although numerous.

Although there are very early records of its presence in the Mediterranean, yet it is even there a very rare fish. It was probably known as early as 1554, for Rondelet, a writer of one of the very earliest natural histories, published a crude figure, calling it *Mugil niger*, which may well have been this species. Aldrovandi, a later writer, called it *Corvus niloticus*. Willoughby, in 1686, also described it. But the first author giving a description of what is without doubt this fish was Risso, in 1810. Since the time of Risso, the fish has been taken several times in the Mediterranean and near the Madeira Islands. Other specimens have been taken near Woods Hole, Massachusetts, and one has been taken in Aus-

tralia. The specimen here mentioned is the first from our coast line, indeed the first from the North Pacific. We have also a number of specimens which are very small, up to an inch and a half in length, which we have taken in the small meshed nets used by the boat "Albacore," and which are very probably this species. If so, the species must be very abundant instead of very rare, and its rarity must be ascribed to the fact that the fishermen do not take it with any of their gear.

It is said, by the European writers who have chronicled its appearance, that it is at times very poisonous. It is thought to feed on jellyfish and such animals, and to approach the coast in the fall in order to spawn. When it is taken it is usually very inactive and feeble in its movements, probably because it is far from its own native habitat, which is thought to be the very deep sea.—W. F. T.

During the work of the "Albacore" there have been taken several very odd forms of fish. Notable among them is a fish with stalked eyes. It seems to be the same species as one which has been taken in the Indian Ocean, and which has been called *Stylophthalmus paradoxus*. The eye stalks are very long, being one and a quarter times the length of the head. The eyes are set on the end of these long slender stalks, and give a very peculiar appearance to the fish. One must be at a loss to know the use to which such eyes could be put. The fish itself is but two and a half inches long and as transparent as a jellyfish, with black dots along the whole of its very slender and delicate body.—W. F. T.

The fish known as the "King of the Salmon" in textbooks dealing with fish, a member of the genus *Trachypterus*, is supposed to very rare. But in the explorations of the "Albacore" numerous young have been taken. It would seem that it is another of those fish which are not taken by the fishermen, and an instance in which it is obvious that the common belief that a fish is rare because the fishermen do not take it, is wrong.

It is undoubtedly true that it is not possible to obtain accurate samples of the life in the ocean, either by commercial or scientific fishing, when the adult fishes are concerned. There are assuredly species which are never taken by any form of gear save when they are disabled or when they accidentally leave their habitats. It must be just as true that species which are abundant at times are capable of hiding themselves or avoiding the available apparatus used for fishing so completely as to give the impression that the species has left the region. The accidental discovery of such cases should render us very cautious in our conclusions regarding the relative abundance of a species in a region, or the migrations which they undertake.—W. F. T.

A species of sanddab hitherto supposed to be confined to Mexican waters has been taken by the "Albacore" in considerable numbers a few miles south of Oceanside and also by fishermen in the region of San Diego. This species, *Citharichthys xanthostigma*, rather closely resembles the sand dab of the San Francisco markets, but is a wider, plumper fish, equal if not superior in quality to its northern relative. It may prove very important commercially.—E. H.

Another interesting specimen taken by the "Albacore" in one of her scientific collecting trips is that of a flying fish, new to these waters. The specimen, of the species *Exonautes rondeletii*, was taken some 150 miles off San Diego; and although the species is of wide range in tropical seas, it has heretofore been recorded on this coast only from Acapulco, Mexico, 1700 miles to the south.

Southern California is supposed to yield but one species of flying fish—the one so well known to the sportsmen-anglers of Catalina Island; and whether the new fish is a permanent resident hitherto undistinguished from the common species, which it closely resembles, or another visitant from the south is still a doubtful question.—E. H.

During February the "Albacore" landed Mr. Horace Linton on San Nicholas, a bleak and desolate island off the southern California coast, for the purpose of making some investigations on the abalone. Mr. Linton is a man over sixty years old.

but he intends to live on the island alone for three months and carry on his observations. He expects to look for abalones which he marked and "planted" there six years ago and also to mark many more. He believes that the supply can be increased by intelligent thinning out and transplanting, but whether or not he succeeds in raising the supply to an extent which will be of commercial value, his observations may throw some light on the habits of this most desirable mollusk.

E. H.

The noting of unusual species in southern California seems to have impressed many people with the opinion that the year 1918 has been a very unusual year. It is very probable that it is such a year, but it is here desired to call attention to the fact that this is the first year during which the Long Beach laboratory of the Fish and Game Commission has been actively watching for unusual species, and that aside from the observations which have been contributed to "CALIFORNIA FISH AND GAME" from it, there have been very few rare species noted, from that vicinity. The popular saying in southern California that "every year is an unusual year in California" comes to mind in this connection, and one must of necessity be very cautious in concluding that last year was any more unusual than the preceding years have been.—W. F. T.

During the past four months the "Albacore" has had the opportunity to take several trips for scientific purposes. On November 26 and 27 one was made to Catalina Island and return to haul for young fish and eggs; November 30 to December 7, a trip was made to Point Concepcion and return to obtain flatfish by bottom trawling; December 8 to 10, the trip to Catalina Island was repeated; December 11 to 14, the coast from San Pedro to San Diego was prospected for flatfish; February 3, 4 and 5, a trip was made to San Nicholas Island with Mr. Panton, to haul nets for young fish and eggs over deep water; and February 6 and 7 were consumed in a trip to Newport to do bottom trawling in the bay. The next trip for scientific purposes should begin about the first of March. These trips have been very largely for the purpose of exploration, and beginning with the March trip, it is hoped to take regular trips over a definite route, in order to follow the development and drift of the pelagic young and the eggs, and to observe carefully three chosen flatfish grounds.

The work in the laboratory has been along lines followed for some time past. The correlation between the temperature, or weather, and the catch of albacore has been carefully analyzed for the year 1915, and a very high degree found. It will be remembered that some work has also been published for the year 1916—for instance in the PACIFIC FISHERMAN for June, 1918, and in a previous number of "CALIFORNIA FISH AND GAME." The data for 1917 is now undergoing a similar analysis. The work on the natural history of the albacore is also steadily progressing along other lines, but until the observations to be made this summer are complete, it is not likely that a final report will be made. A preliminary report on several subjects will probably be made soon. In regard to the sardine it may be mentioned that examinations have been made of the state of maturity at various times, and the progress observed to be the same as was carefully followed last year.

Our thanks are due the Zoology Department of Stanford University for the privilege of using the library and collection of fishes belonging to that institution, and more particularly to Dr. C. H. Gilbert for his personal advice and assistance to Mr. Higgins during his recent visit there.

CONSERVATION IN OTHER STATES.

WARDENS DO DETECTIVE WORK IN NEW YORK.

The New York Conservation Commission has been detailing game protectors upon secret service work in the Adirondacks. They operate under concealed identity, in the manner of detectives, in every branch of police activity. The work that they did and the results accomplished are believed to be more extensive than in any similar task ever before undertaken in the cause of game protection. The reports turned in by these men gave the Conservation Commission the necessary knowledge and power, for the first time in the history of game protection in New York State, to deal adequately with the condition of lawlessness in the deer forests.

ILLINOIS SPORTSMEN DISSATISFIED.

The *Illinois Sportsman*, the official organ of the Illinois Sportmen's League, continues to rap the migratory bird law and accuse the Biological Survey of unfair treatment to the sportsmen of the Middle West. According to a recent number of the paper the lack of ducks during the past open season is due to the working of the present federal law which does not allow early spring shooting, but does allow, according to this paper, the slaughter of a large number of birds in Texas and in other states. The paper also tries to point out that the dismissal of the appeal to the United States Supreme Court for a decision on the constitutionality of the former migratory bird law leaves the Shauver case the supreme law of the land, and questions the immunity of the treaty over review in the courts. It will be remembered that in the case of the *United States* vs. *Shauver*, Judge Trieber held that migratory game when in the confines of a state belongs to the state and not to the public of the United States.

If the sportsmen of the Middle West are actually receiving unfair treatment, it is high time that their case is investigated; but if, on the other hand, they are working selfishly for their own profit and overlooking the general welfare, agitation of this sort should be frowned upon by every one interested in wild life. We are glad that California has so loyally defended the new law which apparently is doing wonders for the preservation of our waterfowl.

WASHINGTON COMMISSION MAINTAINS PERMANENT EXHIBIT.

The Washington Fish and Game Commission maintains a permanent exhibit in the city of Seattle. Aquaria containing many varieties of fish, models of fish ladders, fish screens, preserved specimens of many varieties of fish and shellfish, and an exhibit of fish products form the larger part of the exhibit. Some mounted elk and game birds display the game resources of the state. The offices of the commission are in the same building, and the hundreds of visitors find it easy to have their questions answered.

WASHINGTON WILL OPEN THE SEASON ON ELK.

Of the seven or eight thousand elk on the Olympic Peninsula in the state of Washington, nearly 50 per cent are bulls. In order to reduce this number an open season during the month of November has been recommended to the legislature. Nonresident hunters will be required to hire licensed guides at $5.00 a day, and the license fee will be $25.00 or $50.00. In order that only a limited kill may be made only one animal will be allowed each individual and all the meat must be utilized.

VERMONT PLANS QUARTERLY BULLETIN.

According to their last biennial report the Department of Fisheries and Game of Vermont advocates the publication of a semiannual or quarterly bulletin for circulation among the members of sportsmen's leagues, and others interested throughout the state. This bulletin should give items of interest from the work of the department, and from the wider field of interstate and international activities, in this way moulding and directing public sentiment along the most progressive lines.

Vermont in starting such a bulletin will be following the lead of California and other states which several years ago became convinced of the desirability of such a means of publicity and education.

LIFE HISTORY NOTES.

ELK IN SHASTA COUNTY.

John M. Punnett, a civil engineer of San Francisco, who has recently returned from the Pit River, Shasta County, where he has been in camp with a survey party, reports that in the latter part of November, 1918, a small herd of elk were seen on the mountain side on the north bank of the Pit River. They were observed by all the members of the party consisting of five men. Owing to the speed at which the herd was traveling, the distance between it and the observers and the steep, wooded, brushy character of the country it was impossible to be absolutely certain of the number of animals, but the concensus of opinion was that the herd consisted of one bull and either four or five cows.

Some cattle men who were driving stock out of that part of the country stated that during the past year or so they had repeatedly seen what was presumably the same herd. There is good evidence that the herd ranges on the southerly slopes of the Brock Mountain, between the summit and the Pit River.—M. HALL MCALLISTER.

DEER HUNTING POOR IN MONO COUNTY.

We have no knowledge of any deer having been killed in Mono County during the 1917 season. The season, as changed by the redistricting of California, gives the residents of this county very little chance to kill a deer during open season. The deer range very high in almost inaccessible localities during the month of September, not working down until the season closes.—W. M. MAULE.

DEER INCREASING IN TRINITY GAME REFUGE.

In the ten years that I have been traveling at different times over the southern and western part of the game refuge (1-D) I have never seen so many deer. The numerous deer tracks rather gave the impression of a band of sheep wintering there. Hunters complained last hunting season that, as soon as the shooting commenced, all the deer knew the refuge and ran over the line and stayed there. I believe there is some truth in this, from my own observations, but not so much as they would have the general public believe.—G. O. LAWS.

GROUSE IN THE SEQUOIA NATIONAL FOREST.

Sierra grouse are found from the 5,000 foot contour to the 11,000 in the Sequoia National Forest. They nest principally at the lower elevations between May 15 and June 15, laying from 8 to 14 eggs. The average brood hatched is about 10. Until the young are fully feathered they feed on and in the vicinity of small meadows, eating principally grass, seeds, grubs and berries. When the young are able to fly they usually migrate to the higher elevations and live principally in thickets and fir timber. When there they feed principally on berries and fir and pine needles. A peculiar thing about them is that they go to high elevations to winter and evidently live entirely on pine and fir needles.—FRANK P. CUNNINGHAM.

RIVER OTTER PLAYS ON MOONLIGHT NIGHTS.

Lake Leonard, situated in the mountains of Mendocino County at an elevation of about two thousand feet, is a small natural lake with no visible outlet. The past summer on moonlight nights an animal was frequently heard splashing in this lake. Observation between the hours of 2 and 6 a.m. on December 22 disclosed an animal swimming about and playing in the water like a sea lion, suddenly bobbing up, giving huge splashes, playing about a bit, then disappearing entirely for a time. When most boisterous it uttered a sharp little scream or made a noise that sounded like a long-eared dog shaking itself on coming out of the water. It appeared larger than a large dog, and could swim very rapidly. No slides have been noticed along the shore, but the animal's actions left no doubt that it was a Pacific river otter (*Lutra canadensis pacifica*).—USA BOYLE.

VALLEY QUAIL WITH EGG IN DECEMBER.

When cleaning some valley quail secured near Jolon, Monterey County, December 21, 1918, I was surprised to find a female containing a well developed egg. Unfortunately, the egg was broken in cleaning, but its presence is nevertheless a fact, as can be substantiated by others to whom it was shown. The eggshell was of a yellowish color, and was situated in the oviduct just ready to be deposited.—EDWARD L. BOSQUI.

WILD LIFE IN RELATION TO AGRICULTURE.

BLACKBIRDS AND RICE.

Blackbirds are a serious menace to rice culture, particularly as an agency in the distribution of water grass seeds. While blackbirds in large flocks frequently destroy large areas of rice during the maturing period, they also congregate along the sloughs where the indigenous millets are found the seeds of which mature some weeks in advance of rice, and of which the blackbirds consume large quantities. When blackbirds arise rapidly from a slough it has been observed that they carry with them heads and seeds which are dropped into the fields over which they pass.—W. O. Jacobson.

DUCKS DESTROY GARDEN PESTS.

Theodore Kytka, the famous handwriting expert of San Francisco, has for many years successfully reared wild mallard ducks in his back yard. Finding them of value as destroyers of pests he has recently given a number of the birds to friends in order that they may clean the gardens of snails, slugs, and other garden pests.

PHEASANTS DAMAGE CROPS IN INYO COUNTY.

After much observation and many discussions with ranchers in the Owens Valley I am of the opinion, and would earnestly advocate, that either an open season be allowed for the introduced pheasant, or that it be left unprotected entirely. It is becoming a pest here, and the farmers who raise grain or small fruits welcome this bird about the same as they do the English sparrow and California linnet (two great nuisances). I quote one of the ranger's reports: "The pheasants are increasing rapidly in the valley and live on the farmers' crops in the summer time, doing them considerable damage." One of the fruit growers here showed me a few boxes of grapes which he intended to ship, but the bunches had been thinned considerably owing to damage by birds. He stated that the robin and a small gray bird (probably the linnet) did a lot of damage, and that the pheasant was a very wicked bird, hiding under the bushes and eating his grapes whole. One of the ranchers near town tells me that he has seen small patches of corn entirely destroyed by pheasants, the birds eating out the grain just after the plant has sprouted.—E. L. Herzinger.

MOLE EATS ANGLEWORMS.

The stomach of a mole (*Scapanus latimanus latimanus*) killed on September 23, 1916, at Hayward, California, was filled with angleworms cut into short pieces, one-quarter to one-half inch in length. This evidence, combined with the fact that moles kept in captivity devour large quantities of earthworms, indicates that this animal feeds largely upon worms and insects found beneath the surface of the ground.—W. N. Dibks.

California Fishery Products Compiled by Department of Commercial Fisheries—October, November, December, 1918.

Species of fish	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Solano, Yolo	Sacramento, San Joaquin	Alameda, Contra Costa	San Francisco, San Mateo	Santa Cruz	Monterey	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego	Imperial	Total	Mexico
Albacore								39	5,084		24,982		374		30,479	
Anchovy							5,000		179,788		18,686				203,474	
Barracuda							4,042	7,078	55,476	10,538	86,774		29,499		193,407	11,502
Bonita								180	2,057	2,868	109,805		647,327		762,236	170,604
Bonito							2,149	9,908	233,667						245,724	
Buffalo									16,076		185				16,261	
Chilipepper									43,234						43,234	
Carp				1,206	20,494	13,246	2,420								37,366	
Catfish		5,444		4,258	1,849	1,320									12,871	
Croakers											6,967		371		7,338	
Codfish							150		236		24				410	
Cisco and	212						41,301	8,793	121,415			467			172,681	
Dolphin											21				21	
Dogfish			3,150			8	68,062	500	4,868		2,066		8,052		86,304	
Flounder			242				48,466	11,881	2,452		1,250		100		64,297	
Halibut	1,183						4,068	4,019	2,796	145,126	146,244	4,210	26,950		334,596	160,294
Hardheads					2,652	9,704									12,356	
Hake							2,850	28,490	1,775		7,750		9,467		50,332	4,247
Herring	2,700		184,922				96,200				500				284,122	
Kingfish							17,304	22,750	4,697	240	343,607	20	1,705		390,323	
Mackerel								200	241,200	607	108,144	1,978	9,803		361,932	11,200
Marlin											261				261	
Mullet														2,250	2,250	2,745
Pike				65	35	2,405									2,505	
Pompano			3				277	93	1,026		2,276				3,675	
Perch	2,494		15,500			90	23,441	4,445	2,147	905	15,476		870		49,324	957
Rock Bass										2,059	181,012	885	18,197		202,062	4,130
Rockfish	600		150				102,000	100,000	81,000	35,000	190,000	8,000	304,000		1,020,000	2,000
Surf							1,006,352	172,414	42,332	30,434	7,700	20	1,740		1,261,000	
Salmon	720,000		1,000	10,000	6,000	12,000	200	40	50						750,000	
Smelt	8,000		4,000			90	15,000	10,000	3,000	2,000	110,000	72,000	30,000		250,000	7,000
Sea bass white			10,887				13,000	10,000	14,000	4,000	101,000		5,000		257,000	50
Sea bass (black)									268	200	45,000	240	12,000		58,000	32,500
Sanddabs							10,000	30,000	60		1,000	50			41,000	
Suckers					1,100	300									1,400	

STATEMENT OF EXPENDITURES—Year 1918.

[illegible]	[illegible]	[illegible]	[illegible]
General administration	$1,405 14	$1,457 74	$2,862 88
Research, patrols and education [illegible]	775 00	276 00	1051 00
Feeding		424 29	
Fish [illegible]			
Game [illegible]			
Game farm	40 30	84 10	
Monterey Bay [illegible]	200 00	200 00	400 00
Lobster spiking hearing license	120 48		
Lobster spiking [illegible]			120 48
Hunting license commission	2,501 87	848 00	3349 87
Angling license commission	1,320 00	1,320 00	2640 00
Market fishing license commission	0 00	77 00	77 00
	$6,363 79	$5,687 13	$12,050 92
San Francisco District	$3,082 92	$5,700 00	$8,782 92
Sacramento District	2,520 58	1,000 00	3520 58
Los Angeles District	2,401 05	2,000 00	4,401 05
Launch patrol	1,141 38	1,000 00	2,141 38
Prosecutions (fish and game)	47 50	167 50	215 00
Crawfish inspection	245 70	50 00	295 70
Winter game feeding			
Accident and death claims	121 04	150 00	271 04
	$11,562 17	$10,067 50	$21,629 67
Hatchery administration	$178 79	$800 00	$978 79
Mt. Shasta Hatchery	2,527 05	1,000 00	3,527 05
Klamath Station	1,465 97	1,000 00	2465 97
Mt. Whitney Hatchery	2,055 97	1,000 00	3,055 97
Cottonwood Lakes Station			
Tahoe Hatchery	227 47	16 45	243 92
Tallac Hatchery	25 17	5 00	30 17
Ft. Seward Hatchery			
Eel River Station	692 05	405 00	1097 05
Ukiah Hatchery	14 30		
Snow Mountain Station			
Brookdale Hatchery	99 46	102 15	201 61
Scott Creek Station	30 00	30 00	60 00
Feather River Hatchery			
Almanor Hatchery		10 00	10 00
Domingo Springs Hatchery	87 84		
Clear Creek Hatchery	464 30	28 18	
Bear Lake Hatchery	229 50	200 50	430 00
North Creek Station		721 90	721 90
Wawona Hatchery			
Yosemite Hatchery		120 55	120 55
Fish distribution			
Fish transportation	3 00	3 00	6 00
Screen, fishway and water pollution	241 78	100 97	342 75
Special field investigation			
	$8,697 74	$8,227 05	$16,924 79
Department Commercial Fisheries	2,026 02	3,140 15	5,166 17
	$20,258 19	$22,948 67	$43,206 86
Department of Engineering—			
Launch "Albacore"			
Yosemite Hatchery			

VIOLATIONS OF FISH AND GAME LAWS.

December 1, 1918 to March 1, 1919.

Offense	Number of arrests	Fines imposed
Game.		
Hunting without a license	27	$495 00
Making false statement on application	1	25 00
Deer—close season—killing or possession	11	335 00
Fawns—deer—spike bucks, fawns—killing or possession	5	100 00
Quail—close season—killing or possession		
Excess bag limit	1	25 00
Ducks—close season—killing or possession	2	90 00
Excess bag limit	2	75 00
Shooting ducks from power boat in motion	4	110 00
Cottontail and brush rabbits—close season—killing or possession	1	50 00
Grouse—close season—killing or possession	1	25 00
Quail—close season—killing or possession	1	25 00
Swan—killing or possession	4	75 00
Nongame birds—killing or possession	22	456 00
Shore birds—close season—killing or possession	3	75 00
Night shooting	14	250 00
Trespassing on posted grounds	2	40 00
Trapping without license	2	40 00
Total game violations	103	$2,291 00
Fish.		
Angling without license	5	$95 00
Fishing for profit without license	3	50 00
Clams—undersize	3	75 00
Abalones—close season—undersize—excess limit	34	325 00
Spiny lobsters—close season—taking or possession		
Undersize, oversize	6	140 00
Trout—close season—taking or possession, excess limit	6	180 00
Trout—taking other than by hook and line	3	25 00
Intermingling fish	1	200 00
Failure to produce license on demand	1	
	62	$1,090 00
Grand total fish and game violations	165	$3,381 00

SEIZURES—FISH AND GAME AND ILLEGALLY USED FISHING APPARATUS.

December 1, 1918, to March 1, 1919.

Game.

Deer meat	759 pounds
Ducks	176
Shore birds	17
Wild pheasants	2
Miscellaneous game	20
Heavy rifles	4
Mink skins	3

Fish.

Striped bass	58 pounds
Trout	1,895 pounds
Crabs	42
Pismo clams	100
Lobsters	1,311
Abalones	691
Halibut	2,803
Illegal nets	7

Poaching.

Illegal fish and game	18

NUMBER OF DEER KILLED IN VARIOUS COUNTIES DURING THE OPEN SEASON 1917.

District No. 1.

Alpine	12
Amador	50
Butte	
Calaveras	66
Del Norte	
El Dorado	60
Fresno	125
Humboldt	36
Inyo	72
Kern	
Kings	
Lassen	150
Madera	
Mariposa	
Merced	24
Modoc	104
Mono	36
Nevada	150
Placer	36
Plumas	200
Sacramento	51
San Joaquin	
Shasta	350
Sierra	
Siskiyou	118
Stanislaus	
Sutter	
Tehama	253
Trinity	500
Tulare	300
Tuolumne	250
Yuba	
Total	3,012

District No. 2.

Colusa	150
Contra Costa	221
Lake	125
Marin	102
Mendocino	140
Solano	140
Sonoma	
Yolo	
Napa	116
Total	1,552

District No. 3.

Alameda	
Contra Costa	
Monterey	135
San Benito	121
San Francisco	
San Luis Obispo	342
San Mateo	150
Santa Clara	300
Santa Cruz	90
Total	1,137

District No. 4.

Imperial	
Los Angeles	298
Orange	
Riverside	72
San Diego	30
San Bernardino	96
Santa Barbara	425
Ventura	138
Total	1,248
Miscellaneous	105
Total for year 1917	6,854

A. HOEN & CO., LITH.

GOLDEN TROUT OF VOLCANO CREEK, SALMO ROOSEVELTI EVERMANN

(DRAWN FROM LIFE BY CHARLES B. HUDSON FROM THE

CALIFORNIA FISH AND GAME

"CONSERVATION OF WILD LIFE THROUGH EDUCATION"

Volume 5 | SACRAMENTO, JULY, 1919 | Number 3

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CALIFORNIA TROUT.*

By BARTON WARREN EVERMANN and HAROLD C. BRYANT.

INTRODUCTION.

The trout of whatever kind all belong to the Salmonidæ or salmon family. Besides the true trout, this family contains also the salmons, the charrs, the whitefish, the lake herrings, and that curious fish of the far north, the inconnu. The Salmonidæ are confined to the northern hemisphere and chiefly north of the fortieth parallel where they are nearly everywhere abundant wherever suitable waters are found. Some of the species, especially the larger ones, are marine and anadromous, living and growing in the sea, and entering fresh waters only for spawning purposes; still others live in running brooks, entering lakes or the sea as occasion serves, but not habitually doing so; still

*Although containing some new information, this paper is largely a compilation of material from published sources.

others are lake fishes, approaching the shores or entering brooks in the spawning season, at other times retiring to waters of considerable depths. Some species are active, voracious, and gamey, while others are comparatively defenseless and rarely or never take the hook.

Of all the families of fishes there is none more interesting than the Salmonidæ, from whatever point of view they may be considered. To the biologist the family is of surpassing interest because of the remarkable life histories and habits of many of the species; to the angler, what fish has appealed more strongly than salmon and trout because of their game qualities and their beauty? to the epicure, there is none more delicious or more persistently sought; to the lover of the beautiful as exhibited in animate forms, what appeals more strongly than the silvery sheen, roseate or golden hues, and the beautiful form of the salmon, the brook trout or the golden trout; to the fish culturist, the Salmonidæ are of the greatest interest and importance, more species of this family being propagated artificially than of all other species combined; and to the commercial fisherman, this family of fishes is the most important in all the world.

The true trout all belong to the genus *Salmo* and are found only in the northern parts of Asia, Europe and North America; in Europe they extend as far south as the Pyrenees, and in America to Lower California and Durango and eastward as far as the Black Hills and Colorado.

The name "trout," a word of French origin, is in Europe applied only to species with black spots, while in America it is more loosely used and is applied not only to the true trout (those with black spots), but also to the charrs (or those with red or orange spots). In western North America are many species of true trout, some of them differing widely in size and color, while others resemble each other so closely as to make positive identification difficult. The Salmonidæ are of comparatively recent origin, none of the species occurring as fossils except in recent deposits, and this doubtless accounts for the instability of their specific characters.

How to Distinguish Trout from Salmon.

Trout.	Salmon.
1. Most species remain in fresh water, never going to sea; do not die after once spawning.	1. Live habitually in the sea, entering fresh water only at spawning time; spawn once then die.
2. Skeleton hard.	2. Skeleton porous and soft.
3. Anal fin with 12 or fewer rays.	3. Anal fin with 13 to 20 rays.
4. Gillrakers, 20 or fewer.	4. Gillrakers, 20 to 40.
5. Pyloric cæca few, 40 to 65.	5. Pyloric cæca numerous, 75 to 180.
6. Branchiostegals, 10 to 12.	6. Branchiostegals, 13 to 19.
7. Caudal peduncle deep.	7. Caudal peduncle constricted.

The commercial fisherman distinguishes between salmon and trout by noting whether the fish is easily held up by the tail. The constricted portion in front of the tail (caudal peduncle) makes it easy to hold a salmon by the tail, but that of a trout is so nearly the size of the tail fin that it is held up with difficulty.

The native trout of western North America may be regarded as falling naturally into three more or less well-defined series, which are popularly

known as the Cutthroat Series, the Steelhead Series, and the Rainbow Series.

The species of the Cutthroat Series are characterized by small scales, 150 to 200 in a cross-series, a large deep-red or scarlet dash on each side of the throat, a large mouth, the maxillary more than half length of head, and small hyoid teeth. The most useful diagnostic character is the red dash or mark on each side of the throat between the dentary bones of the lower jaw. This mark is nearly always present and is usually quite distinct.

There are many species of the Cutthroat Series. They inhabit the streams and lakes from Humboldt County, California, northward to southeast Alaska and eastward through all of the northwestern states to the headwaters of the Missouri, the Platte, the Arkansas and the Rio Grande. At least one species is found in the headwaters of the Colorado. They are particularly abundant in the coastal streams and lakes of Oregon and Washington. In California, they appear to be confined chiefly to the northwest counties and are nowhere abundant.

In the Steelhead Series the scales are somewhat larger, the number in a cross-series being usually about 150, but varying from 130 to 180. There is no red dash on the lower jaw; the body is rather stout, mouth moderate, the maxillary about half length of head, hyoid teeth wanting. Color silvery. Size large. Sea-run species.

In California, the steelhead is limited to coastwise streams and is anadromous. To the northward, it extends further inland, ascending the Columbia and its tributaries to Shoshone Falls in Snake River and to the headwaters of Salmon River in Idaho. To the northward it is found as far as Kodiak Island. In certain lakes of Washington and British Columbia are found several local forms which have been described as distinct species.

In the Rainbow Series the scales are typically still larger (except in the golden trouts), the number in a cross-series being normally 130, but varying from 115 to 180; usually no red on the throat; a red or rosy lateral band, body stout; mouth small, the maxillary short, 2 to 2.5 in head; no hyoid teeth. Size small.

The rainbow forms are chiefly confined to the streams of California and Oregon. The typical rainbow (*Salmo iridens*) was originally described by Dr. William P. Gibbons of San Francisco in the Proceedings of the California Academy of Sciences for 1855, from specimens obtained in San Leandro Creek, Alameda County. The rainbow occurs less abundantly in Oregon and Washington and as far north as Naha Stream and Klawak River, Alaska.

Besides these three series of true trouts, we have the charrs of the genera *Salvelinus* and *Crestivomer*. The "Dolly Varden" is the only native charr in California. The introduced Eastern brook trout is a near relative, and is, like it, a charr. The charrs are separated from the true trout by the presence of red or orange-colored spots on the sides. The word "charr" means "red" or "blood," and since members of the genus *Salvelinus* are usually marked with red spots or are red beneath, the group is well named.

In addition to the native trout, there are several species which have been introduced into California streams from Europe. Chief among these are the brown trout from central Europe and the Loch Leven trout from Scotland.

Cutthroat Series.

The native lake trout in the larger lakes of the Sierras and one of the stream trouts of northern and northwestern California are cutthroats. The species now recognized are:

Cutthroat Trout (*Salmo clarkii*), in Pit River, Eel River and other streams in Humboldt and Del Norte counties.

Tahoe Trout (*Salmo henshawi*), in Lake Tahoe, Donner, Webber, and Independence lakes and tributary streams. Included under this name are several trout which have been described as distinct species.

Royal Silver Trout (*Salmo regalis*), in Lake Tahoe.

Fig. 36. Cutthroat trout (*Salmo clarkii*).

Charrs.

The Dolly Varden (*Salvelinus parkei*) is the only charr native to California streams. Its distribution in this state is limited to the McCloud River. The introduced Eastern brook trout (*Salvelinus fontinalis*) and the Mackinaw Trout (*Cristivomer namaycush*) are the only other charrs found here.

Rainbow Series.

Most of the native trout found in California belong to this series. The following eight species are here recognized as belonging to the Rainbow Series.

Shasta Rainbow (*Salmo shasta*), in the upper Sacramento and McCloud rivers.

Noshee or **Stone Trout** (*Salmo stonei*), in the McCloud River.

Gilbert Rainbow (*Salmo gilberti*), in the Kings and Kern rivers.

South Fork of Kern Golden Trout (*Salmo agua-bonita*), native only to the South Fork of the Kern, and from Cottonwood Creek and the Cottonwood Lakes into which it has been introduced.

Golden Trout or **Roosevelt Trout** (*Salmo roosevelti*), native only to Volcano Creek.

Soda Creek or **Little Kern Trout** (*Salmo whitei*), native to the Little Kern and other western tributaries of Kern River.

San Gorgonio Trout (*Salmo gilae*), known only from the streams about San Gorgonio Peak, southern California.

Nelson Trout (*Salmo nelsoni*), known only from the San Pedro Martir Mountains of Lower California.

There is a trout, apparently of the Rainbow Series, in the Klamath River which fish culturists believe to be different from any of the above, which has not yet been described. There is still another in Burney Creek, Shasta County, which also remains to be described.

Introduced Trout.

As a result of hatchery operations the following non-native trouts are to be found in California streams:

Brown Trout (*Salmo fario*), a native of central Europe.

Loch Leven Trout (*Salmo trutta levenensis*), a native of Scotland.

Eastern Brook Trout (*Salvelinus fontinalis*), a native of the Atlantic Coast streams.

Mackinaw Trout (*Cristivomer namaycush*), a native of the larger lakes of the northeastern United States and Canada.

Size and Coloration.

Size seems to depend upon food supply and extent of water. Residents of small mountain streams and pools seldom attain the size of individuals inhabiting lakes or rivers where there is an abundant food supply.

Water appears to have some influence on the coloration of trout. Brackish or salt water usually gives them a silvery color with few or no spots. Possibly the substrata constitute the factor most involved in coloration. Profusely spotted trout are generally found in clear rapid rivers or alpine pools; in large lakes with a peaty bottom, fish often assume an almost uniform blackish coloration.

Sexual differences are not always apparent in trout except in the breeding season, at which time the female is usually a deeper, heavier fish and the male a more slender one. However, the male is sometimes the brighter in color.

Young trout are all similarly barred with the parr-marks and are difficult to identify.

Trout Angling.

The usual style of fly fishing consists in wading the stream and making casts downstream in likely places—at the foot of riffles, at the edges of stumps, logs and brush, and beneath overhanging bushes and banks. On the contrary, the more refined, dry-fly angler casts upstream, presenting his fly in such a manner that it will float over a rising fish. In order to have the flies float, they must be dry. They are oiled before using, and false casts are made between real casts to remove the surplus moisture.

Some fishermen drag the flies over the water at the end of each cast, believing that the motion resembles that of an insect endeavoring

to escape from the water. Sometimes flies are tied with head toward the hook-barb so that, on being drawn over the water, the resistance of their legs and wings will cause them to flutter as if alive.

The dry fly angler declares that the more attractive method is to allow the flies to float quietly, and to enable them to remain on the surface. Usually local dealers can supply the best information on the proper flies to use.

When streams are high, better results are obtained by the use of baits such as prepared salmon eggs or grasshoppers, earthworms and helgramites. In clearer water spinners may also be used with good effect.

Fig. 37. Tahoe trout (*Salmo henshawi*).

Trolling is the method usually employed by fishermen and anglers in catching trout in the larger lakes. Similar equipment is used by anglers in taking the so-called steelhead at river mouths. But these methods are not practiced by the accomplished angler.

"Along the lower courses of the rivers and on the lakes, especially off rocky points where the rapidly shelving bottom brings the deep water near shore, a crude method of bait casting is successfully employed in taking large trout. The large trout seldom rise to the artificial fly except at times in the high Sierras. The same species when living in the rivers and in their rapid and cool tributaries furnish excellent sport for the angler. All recommend small flies, 12 to 16, and not in great variety. Many of the smaller streams are so closely lined with dense brush as to make fly fishing quite out of the question. Here the angler should provide himself with a short bait rod, use worms and grasshoppers."—*Snyder*.

As has been pointed out in many an article, the prime rules of fly fishing are:

1. Fish in streams where trout are found. Those streams not easily accessible are always best, for they are not depleted.

2. Move cautiously and noiselessly in order not to frighten the fish.

3. Drop the fly on the water "as if it hated to get wet" or, in other words, simulate the natural dropping of an insect on the water.

KEY TO CALIFORNIA SPECIES OF TROUT.

a. Species anadromous, entering coastal streams for spawning purposes; color silvery;

aa. **Species not anadromous; size smaller.**
size large ..... **Steelhead** (Salmo gairdneri). Page 112

b. Scales typically large (except in the Golden trouts), about 140 in a cross-series (varying from 120 to 150); little or no red on throat; usually a rosy or yellowish lateral band; mouth small, **maxillary 2 to 2.5 in head; no hyoid teeth; size** small.

c. No extensive lemon yellow on sides below lateral line.

d. Body elongate, color rosy or silvery, especially on side; spots small ..... **Rainbow Trout** (Salmo irideus). Page 112

dd. Body rather deep.

e. A reddish lateral band.

f. Black spots largely restricted to the back, few below median line.

g. Vomerine teeth in a single zig-zag series ..... **McCloud River Trout** (Salmo shasta). Page 115

gg. Vomerine teeth in two irregular series ..... **Noshee Trout (Salmo stonei). Page 116**

ff. Entire body and all fins profusely black-spotted ..... **Kern River Trout** (Salmo gilberti). Page 118

fff. Heavily and uniformly spotted, fawn brown on sides ..... San Gorgonio Trout (Salmo evermanni). Page 117

ee. A greenish lateral band ..... **Eagle Lake Trout** (Salmo aquilarum). Page 116

cc. Extensive lemon yellow or orange on sides and belly.

h. Back and upper two-thirds of sides covered rather closely with small black spots; lower third of side, except on caudal peduncle, **without spots ..... Golden Trout of the Little Kern, or Soda Creek Trout** (Salmo whitei). Page 121

hh. Back and upper one-third of side sparsely black spotted; lower two-thirds of side, except on caudal peduncle, entirely without spots ..... **Golden Trout South Fork of Kern** (Salmo agua-bonita). Page 123

hhh. Back, head, and entire side, except on caudal peduncle, entirely without spots; a few spots on the caudal peduncle ..... **Roosevelt Trout (Salmo rooseveltl). Page 124**

bb. Scales small, usually about 150-200 in crosswise series; red marks under dentary bones always present; mouth large, the maxillary 1.6 to 2.25 in head; hyoid teeth **present; irregularly and profusely scattered.**

i. Black spots encroaching somewhat on belly ..... **Cutthroat Trout** (Salmo clarkii). Page 127

ii. **Black spots sparsely scattered ..... Tahoe Trout** (Salmo henshawi). Page 127

iii. No black spots; back bluish or greenish ..... **Royal Silver Trout** (Salmo regalis). Page 129

bbb. Scales so small as to be almost invisible, 200-250 in lateral series; no red on throat

j. Sides with red spots

k. Back unspotted, strongly marbled with dark olive or black ..... **Eastern Brook Trout** (Salvelinus fontinalis). Page 130

kk. Back not marbled with olive or black, but spotted with red or orange ..... **Dolly Varden Trout** (Salvelinus parkei). Page 129

jj. **Back and sides with gray spots ..... Mackinaw Trout** (Cristivomer namaycush). Page 133

bbbb. Scales very large, 115-130 in lateral series, introduced species

i. **Adipose fin large, its width much more than half its length ..... Brown Trout (Salmo fario). Page 131**

ii. **Adipose fin small, its width one-half its length ..... Loch Leven Trout** (Salmo trutta levenensis). Page 132

NATIVE SPECIES.

Steelhead Series.

STEELHEAD.

Salmo gairdneri Richardson.

Other names: Steelhead Trout; Steelhead Salmon; Salmon Trout; Hardhead.

Description: Head in length to base of tail fin 4.5 to 5; depth 4.5; eye 4.5 in head; dorsal 11, anal 11 or 12; branchiostegals 11 or 12; scales usually about 30-150-28, the cross-series varying from 130 to 180; pyloric cæca 42; gill-rakers, 8+12; vertebræ 38+20. Body rather stout, the caudal peduncle thick; head rather short and slender, only about twice length of maxillary; eye small; teeth small, those on vomer in two long, alternating series which are about as long as the palatine series; no hyoid teeth. Tail wide, squarely truncate in the adult, emarginate in the young. Color olive-green above, silvery on sides and belly, head, back, and dorsal and caudal fins more or less closely covered with small black spots. During the breeding season, side with a broad rosy or flesh-colored lateral band, deep rosy on the cheek, this often remaining through the year; fins not red; no red on lower jaw.

Marks for field identification: Large size; small head; large scales; bright silvery color; absence of red on lower jaw.

Distribution in California: The steelhead enters coastwise streams from Ventura River northward, ascending to their headwaters for spawning purposes and then returning to the sea.

The steelhead is more or less anadromous in its habits, it being migratory like the salmon, spending much of its time in salt water, and ascending freshwater streams at spawning time. It enters practically all the coastal streams of California from Ventura County on the south to the Oregon line; also from there to Skagway and Sitka. Many of the streams on the California coast are famous for their steelhead; special mention may be made of Ventura River, the Santa Ynez, Santa Maria, those entering Monterey Bay, and all the streams north of San Francisco, particularly the Russian, the Klamath, and the Eel.

As a game fish the steelhead is a favorite with the anglers. Its game qualities, together with its large size, make this one of the fishes most sought after by the followers of good old Isaak Walton. When in fresh water it will not only take the trolling spoon, but it will rise readily to the fly.

The steelhead is an excellent food fish, and its large size and abundance make it a fish of considerable commercial value. It is an important fish in the fish cultural operations of California and of other Pacific Coast states and the federal government. It has been introduced into Lake Superior and is now an abundant and much prized game fish in that lake and its tributary streams.

The fact that most ichthyologists and many anglers regard steelheads simply as sea-run individuals of rainbow trout has not escaped our minds, and we ourselves are inclined to accept that view. Nevertheless we know that in some places, they are entirely distinct and easily distinguishable. At any rate, we deem it best for our present purposes to treat the steelhead as a distinct species.

RAINBOW TROUT.

Salmo irideus Gibbons.

Other names: Mountain Trout; Speckled Trout; Brook Trout; California Trout. Sea-run form: Steelhead; Steelhead Salmon; Salmon Trout; *Salmo rivularis*, in part; *Salmo gairdneri*, in part.

—*From drawing by Charles Bradford Hudson*

STEELHEAD TROUT (*Salmo irideus, a sea-run form*)

Description: Head 3.8; depth about 4; eye 4.83 in head, 1.4 in snout; snout 3.6; D. 10, A. 11; scales 21-130-20, about 70 series in front of dorsal, counting along median line, or 60 if rows along upper side are counted; branchiostegals 11; gill-rakers 8+13, rather long and slender. Head pointed, mouth rather large, maxillary extending to posterior margin of eye, 1.8 in head, with about 20 teeth; preorbital very narrow, the maxillary almost touching the orbit; several large teeth along side of tongue, no hyoid teeth; teeth on vomer in zig-zag series; origin of dorsal at middle of length; origin of anal midway between that of dorsal and base of caudal; caudal broad, nearly truncate. Color, on the back a deep dark blue ultramarine of a peculiar transparency, dotted with small round black spots about the size of a pin head; side abruptly brighter, with many scales silvery; lower parts white; sides, top of head, dorsal, and caudal fins covered with very small spots; pectorals and ventrals nearly colorless, without spots; adipose fin with two spots; no red on lower jaw.

Marks for field identification: Rainbow trout usually have a great many spots which are more or less obscured by a silvery sheen in the sea-run examples. Average specimens are from 4 to 12 inches in length and weigh as much as 6 or 7 pounds, but average 3 or 4. Sea-run examples sometimes weigh 25 pounds. From the cutthroat trout the rainbow may be known by its larger scales, brighter coloration, and by the absence of red on the throat. The comparatively large scales (120-150) distinguish the true rainbow from the species found in the McCloud and Kern rivers.

Distribution: Native in all coastal streams and most streams of the interior, especially those of the western slope of the Sierras. Introduced in many lakes and streams of the state formerly barren of fish life.

The rainbow runs upstream in early spring to spawn, leaping over waterfalls and entering the small streams forming the headwaters. Here the eggs are deposited in the sand and the young are hatched out.

Fig. 19. Young steelhead trout. All young trout have black bars on the sides, which are known as parr marks.

By far the largest output of the state hatcheries is composed of rainbow trout, and there is good reason, for this is considered the best game fish of all and it is most highly prized by anglers. The rainbow often leaves the water in its eagerness to take a fly. In fact, so readily does it take a fly that there is seldom need to resort to bait or other lures.

This trout has thriven almost everywhere, having been introduced into New Zealand, Japan, Europe, and the eastern United States.

The rainbow varies in coloring according to age, sex, and location. Those individuals which are able to reach the sea spend part of each year there, returning to the freshwater stream a larger and more silvery-colored fish commonly called steelhead. Spawning fish travel far up the coastal streams and spawn high up in the small tributaries. Their habits in this regard are more like those of the salmon than those

of a trout. Unlike the salmon, however, the steelhead does not as a rule die after once spawning.

Specimens returning from the sea are usually silvery in color, but spotting soon appears in the freshwater stream. Because of its large size and excellent flavor the sea run form is a splendid food fish. It is marketed in large quantities during the open season; as a game fish prized by anglers who troll in the bays and river mouths along the northern coast.

"In beauty of color, gracefulness of form and movement, sprightliness when in the water, reckless dash with which it springs from the water to meet the descending fly ere it strikes the surface, and the mad and repeated leaps from the water when hooked, the rainbow trout must ever hold a very high rank. The gamest fish we have ever seen was a 16-inch rainbow taken on a fly in a small spring branch tributary of Williamson River in southern Oregon. It was in a broad and deep pool of exceedingly clear water. As the angler from behind a clump of willows made the cast the trout bounded from the water and met the fly in the air a foot or more above the surface; missing it he dropped upon the water only to turn about and strike viciously a second time at the fly just as it touched the surface; though he again missed the fly the hook caught him in the lower jaw from the outside, and then began a fight which would delight the heart of any angler. His first effort was to reach the bottom of the pool, then, doubling upon the line, he made three jumps from the water in quick succession, clearing the surface in each instance from 1 to 4 feet, and every time doing his utmost to free himself from the hook by shaking his head as vigorously as a dog shakes a rat. Then he would rush wildly about in the large pool, now attempting to go down over the riffle below the pool, now trying the opposite direction, and often striving to hide under one or

Fig. 39. Rainbow trout taken in Manzanita Lake, near Red Bluff, Tehama County, California.

—From drawing by Charles Bradford Hudson

RAINBOW TROUT (*Salmo irideus, a stream form*)

the other of the banks. It was easy to handle the fish when the dash was made up or down stream or for the opposite side, but when he turned about and made a rush for the protection of the overhanging bank upon which the angler stood, it was not easy to keep the line taut. Movements such as these were frequently repeated and two more leaps were made. But finally he was worn out after as honest a fight as trout ever made.

"The rainbow takes the fly so readily that there is no reason for resorting to grasshoppers, salmon eggs, or other bait. It is a fish whose gameness will satisfy the most exacting of expert anglers and whose readiness to take any proper lure will please the most impatient of amateurs." (Evermann.)

Spawning takes place in winter and early spring, varying with temperature and locality. The bulk of the eggs are usually taken in February, March, and April, although spawning continues through May in the mountain districts. The average yield from each female is about 900 eggs. A few of the females spawn when three years old, but about one-half of them begin at four years. The egg is from one-fifth to two-ninths of an inch in diameter; it has a pink color when first taken, becoming darker before hatching. The rainbow feeds on worms, insect larvæ, and salmon eggs. In streams in which the salmon and rainbow exist together, the rainbow is more destructive to the salmon eggs than any other species except the Dolly Varden.

McCLOUD RIVER TROUT.

Salmo shasta Jordan.

Other names: Shasta Trout; Shasta Rainbow. *Salmo gairdneri shasta; Salmo irideus shasta.*

Description: Head 4; depth 3.8; eye 5; D. 11; A. 11; scales 20 to 24-145-20, about 65 before the dorsal. Body comparatively short and deep, compressed, varying considerably, and much more elongate in males than in females; head short, convex, obtusely ridged above; mouth smaller than in most species of trout, the rather broad maxillary scarcely reaching beyond the eye, except in old males; eye large, about one-fifth length of head, vomerine teeth in two irregular series; dorsal fin moderate; caudal fin distinctly though not strongly forked, more deeply incised than in the typical cutthroat. Color, bluish above, the sides silvery; everywhere above profusely but irregularly spotted, the spots extending on the sides at least to the lateral line, and covering the vertical fins; top of head well spotted; fins usually not red, much red or rosy on cheeks and opercles, belly partly red in males; side with a broad but more or less interrupted red lateral band, brightest in males. (Jordan and Evermann.)

Marks for field identification: Differs from other rainbow trout, with the exception of that in the Klamath River, in its larger size, smaller mouth and larger eyes. Scales are intermediate in size between cutthroat and sea-run rainbow (steelhead), about 145 in transverse series. Caudal fin more deeply incised than in typical cutthroat.

Distribution: McCloud River and streams of the Sierras from Mount Shasta southward at least to Calaveras County.

This rainbow lives in water with a comparatively high temperature if it is plentiful and running with a strong current; but in sluggish water, even when the temperature is considerably lower, no species will do well. This species appears to inhabit the rapids more largely than the slow-moving water. The spawning season in California extends from early February to May. Males are good breeders at two years old, but the females rarely produce eggs until the third season. It may lack a little in the wild gaminess of the typical rainbow, but that is

made good by its larger size. It is largely an insect feeder and, therefore, a favorite of the fly fisherman.

This is the rainbow which has been most widely used in fish cultural operations and has been more widely distributed than any other variety.

NOSHEE TROUT.

Salmo stonei Jordan.

Other names: Nissuee Trout; Stone's Trout; Nissui Trout; *Salmo irideus stonei.*

Description: Depth 4; A. 11; eye 4.5; maxillary about 2; pectoral 1.3; scales 140 to 155, about 82 before the dorsal, where they are small and embedded; teeth fewer and smaller than in the Shasta trout, those on the vomer in a single zig-zag series. Color, upper parts plain greenish; spots few and confined chiefly to the posterior part of body; spots small and sparse on dorsal, adipose and caudal fins; a red lateral band usually distinct; cheeks and opercles with red; no red on throat. (Jordan and Evermann)

Marks for field identification: Much larger than typical rainbow, reaching a weight of 10 to 12 pounds; teeth are fewer and smaller than those of typical rainbow.

Distribution: Upper Sacramento Basin, especially in the McCloud River above Baird.

Voracious. Little is known about this trout.

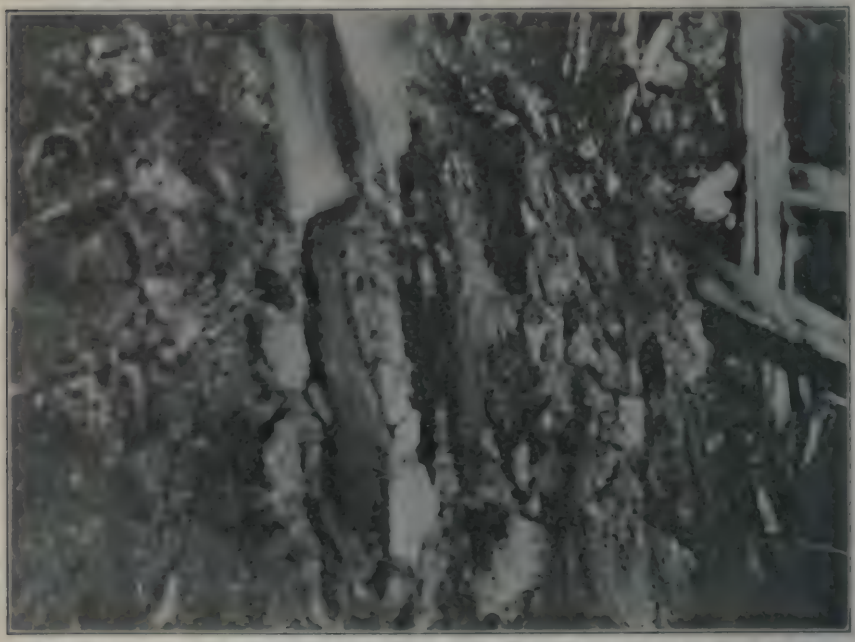

Fig. 40. Trout spawning. The female can be seen at the left digging up the sand preparatory to depositing eggs. The male is shown at the right. Photograph by J. H. Geiger, taken on Orchard Creek, San Bernardino Mountains, April 25, 1916.

EAGLE LAKE TROUT.

Salmo aquilarum Snyder.

Other names: *Salmo clarkii,* in part.

Description: Head 4.2 in length to base of caudal; depth 4.2; depth of caudal peduncle 9.8; eye 7.5 in head; interorbital space 3; snout 3.5; maxillary 1.9; height of dorsal 6.5 in length; adipose fin 12.5; length of caudal 4.8; pectoral 5.6;

ventral 7.5, height of anal 6.9; scales in lateral series 136. Body deep, caudal peduncle robust; head rather pointed; maxillary broad and long, extending far beyond posterior border of eye; edge of opercle 3.5 in head. Branchiostegals 14. Gillrakers 18, rather thick at base, pointed at tips, and decidedly sickle-shaped. Vomerine teeth in three series in front, the middle ones extending backward; teeth of palatines, maxillaries, and mandibles in a single series; glossohyal with teeth; last branchials without teeth. Scales large and deeply embedded; pores in lateral line 120, series of scales above lateral line, counting upward and forward to a point just before dorsal, 29. Scales of nape minute and closely crowded as are those of throat and abdomen. Axillary scales of ventral small, equal in length to vertical diameter of eye, sharply pointed. Dorsal rays 14, edge of fins concave; adipose dorsal very large, broad and thick; caudal broad and strong, the posterior edge slightly concave, the lower lobe a little longer than the upper; anal ray 11, edge of fin somewhat concave; pectorals strong and rather pointed; ventrals obtusely pointed.

Marks for field identification: Distinguished from other trouts of the Sierras by the robust body with a deep caudal peduncle and large and strong fins, conspicuous adipose fin, large scales, and the red color of cheeks and coppery red of under parts. The flesh is deep red, very firm and fatty, far superior to that of the Tahoe Trout.

Distribution: Eagle Lake and its tributary, Pine Creek.

The annual spawning migration occurs in May, when apparently the entire trout population of the lake attempts to move up Pine Creek. It is said that anglers do not succeed in catching trout in Eagle Lake, their failure being attributed to either a scarcity of fish or an abundance of food. (Snyder.)

Fig. 41. San Gorgonio trout (*Salmo evermanni*). Found only in the upper Santa Ana River, Mount San Gorgonio, southern California.

SAN GORGONIO TROUT.

Salmo evermanni Jordan & Grinnell.

Other names: Evermann Trout. San Bernardino Rainbow Trout.

Description: Length of type, an adult male (as measured when first caught), 11.62 inches; head mounted along side 2.75 inches. Head 3.82 in length to base of caudal, the base being somewhat produced; depth of body 4.7, eye 6.5 in head, maxillary 4.75 in head; dorsal with 13 rays, and with 10 or 11 scales between base of dorsal and lateral line, 167 oblique rows crossing lateral line, and 33 scales between lateral line and vent. Snout (from eye) 3.2 in head, and 2 in head; ventral 4.5 in head; pectoral 4.37 in head; dorsal 4.57 in head. Caudal distinctly emarginate, or lunate. Vomerine teeth in two straight rows; hyoid teeth present, though barred in places; Maxillary extending well beyond eye, so that the mouth is relatively large. In the female, the head is shorter and the maxillary 4.8 in head. Coloration very dark green-brown, the spots unusually large and covering the whole length of the body, none of the brilliant hues of *Salmo agua-bonita*, *rosaceus* or *whitei*, nor even the crimson of *gilberti*. Ground green color along sides, varying toward red-brown dorsally; a large patch of same color on cheek; lower parts lighter (fresh taints unknown, but no red in Orbital region shown in the specimens); black spotting conspicuous, the spots evenly distributed, very large, on sides posteriorly the size of pupil

or larger, smaller on top of head; 25 on dorsal fin, mostly in four rows; caudal fin nearly as distinctly spotted as sides, with spots more closely set. Younger individuals are somewhat lighter, but yet considerably darker than *irideus* of the same size, and the other characteristics seem to be constant.

Marks for field identification: Differs from the rainbow in small size and slightly different coloration. As compared with *Salmo irideus*, *Salmo evermanni* is slenderer, especially dorso-ventrally; the head is longer, the snout sharper, and mouth larger; the scales are very much smaller and more numerous, not overlapping; the colors are dull and very dark, and the spotting is heavy.

Distribution: Upper Santa Ana River in the San Bernardino Mountains of southern California.

Habits similar to other rainbows. It is probable that the San Bernardino trout is the older species in the region where found, and owes its preservation as a distinct species, and perhaps the accentuation of its characters, to isolation afforded by the barrier which prevents the invasion of the rainbow trout from the lower stream. In the remote history of the stream, the falls have doubtless shifted and become more effective, so that the ancestral stock of San Gorgonio trout was originally able to ascend to its present remote and limited habitat. (Jordan and Grinnell.)

Fig. 12. Eagle Lake trout (*Salmo aquilarum*). Found only in Eagle Lake and tributary streams.

KERN RIVER TROUT.

Salmo gilberti Jordan.

Other names: Gilbert Trout; Kern River Rainbow Trout; *Salmo irideus gilberti*.

Description: Head 4 in length to base of caudal; depth 3.6; eye 5 in head; snout 4.3; maxillary 1.6; mandible 1.3; preorbital 20; scales small, about 165 in lateral line; dorsal fin with 14 rays; anal 12. Body stout, moderately compressed, deepest slightly in front of dorsal, head long, conic, snout pointed; mouth large, maxillary long and narrow, reaching more than an eye's diameter beyond the eye; mandible slightly curved, teeth on lower jaw rather strong, wide-set, in a single series, those on maxillary strongest; caudal peduncle stout, its least depth equal to snout and eye. Fins all well developed; origin of dorsal midway between tip of snout and base of tail, the longest ray nearly two in head, base of fin slightly greater than height; caudal broad, truncate, the lobes equal, exceeding height of dorsal; base of anal equaling height of dorsal; origin of ventrals somewhat posterior to that of dorsal and much nearer base of caudal than tip of snout, longest ventral ray equal to longest dorsal ray; longest pectoral ray exceeding by one-fourth the height of dorsal.

Color in life, head, body, and fins everywhere profusely and rather uniformly covered with small black spots, those on body stellate, those on fins oblong, those on head roundish and more sparse; inner half of ventrals with the anterior rays white at tip; adipose dorsal olivaceous with three or four black spots; side broadly rich rosy red, broadest and brightest near middle, least distinct on caudal peduncle; lower half of side slightly pink and pale bluish; belly with

slight irregular wash of old gold on dirty-white ground color; back and upper part of side olivaceous with fine yellow, orange, or lemon specks; cheeks and opercles rich rosy; little or no red on throat, no dash on membrane between rami of lower jaw; few spots on side of head; top of head olive green, well covered with round black spots.

This description is from an example (male) 18.25 inches long, weighing 3.5 pounds, taken by the senior author July 19, 1904, in Kern River about one-half mile above Kern Lake.

Marks for field identification: Profusely and closely spotted over the entire body, head, and on all the fins, the belly not so richly colored. It is similar to the McCloud River trout, but has smaller scales, about 165 in a transverse series. There is usually a distinct whitish tipping to the dorsal, ventral and anal fins.

Distribution: Kern, and probably Kings, Merced and other rivers of the southern Sierras. This species is abundant in Kern Lake and in the river for some miles below the lake, but of this we have no personal knowledge, as no collecting has been done below the lake. As a rule, the fish taken from the river are more deeply and brightly colored and decidedly more gamey than those from the lake. During the spawning season early in the spring the fish are found chiefly in the river, but after the spawning has been completed they tend to run down into the lake, where they become less active and less highly colored. Large examples from the lake are, as a rule, more slender than those from the river, probably on account of the fact that those from the lake are all spent fish.

The Kern River trout is a beautiful fish, well built and symmetrical, and very rich in coloration when in prime condition. As a game fish it will stand easily among the best, but, as already stated, in the river it greatly excels those of its kind in the lake. It usually takes the fly quite freely, and will, of course, take all sorts of live or cut bait. We have taken these trout "with the artificial fly, with grasshoppers (which they greatly preferred), and with pieces of fish or other meat. The large example from which the colored plate was made was first tried with a gray hackle, to which he rose once and then paid no more attention to it. A larger, plain hook and a good-sized grasshopper were substituted, with better results. Scarcely had the lure touched the water when he rose and struck most viciously, only to miss it, then turn and strike more viciously than before. This time the hook caught inside the mouth just under the middle of maxillary, and then began a fight that would delight a better angler than I. He first circled about in a wide curve, then jumped twice, clearing the water beautifully each time; circled again, went to the bottom in water ten feet deep, came to the surface and jumped again, after which no more leaps were made, but he continued dashing about until finally brought to net." (Evermann.)

THE GOLDEN TROUT OF CALIFORNIA.

The golden trout of California are, so far as known, found only in the headwaters of the Kern River, all in the vicinity of Mount Whitney. To be sure, through the activities of the California Fish and Game Commission and other agencies, their original distribution has been somewhat extended by transplanting.

Four species of trout are now recognized as native to the upper Kern River basin, namely: the Kern River trout or Gilbert trout (*Salmo gilberti*), the Soda Creek or White's golden trout (*Salmo whitei*), the South Fork of Kern golden trout (*Salmo agua-bonita*), and the Roosevelt trout or golden trout of Volcano Creek (*Salmo roosevelti*). All except the Gilbert trout are of the golden trout type.

All four of these species belong to the Rainbow Series, the species of which as a whole may be distinguished, with greater or less difficulty, from those of the Steelhead Series or sea run rainbows on the one hand by the usually brighter colors, and on the other hand, from the Cutthroat Series by the absence of a red or scarlet dash on the throat and the entire absence of hyoid teeth.

The three species of golden trout differ as a group from the other recognized species of the Rainbow Series in having decidedly smaller scales and a very brilliant coloration.

When the first trout came to the beautiful streams of the southern High Sierra no one certainly knows; but it must have been long, long ago, as men count time, when melting ice filled the Valley of Death and the terrible deserts of Panamint and Amargosa with sweet waters. Long before that time trout had found their way into the Rio Colorado and when the ice came it was not hard for them to push westward to certain headwaters of the San Joaquin. Among the first to come were some that took up their home in the Great Kern, a wild, strange river, whose sources are among the highest of California's great mountains and whose course for many miles is almost meridional by the compass through a great canyon hundreds of feet deep and marvelous in its stupendous grandeur and beauty. In this river the trout were free to roam about as they liked. Sometimes they would go far down the stream and even out into that wonderful Tulare Lake, then much larger and much colder than it has ever been since. Then in early spring they would go the other way, even entering the tributary streams and penetrating to the little rivulets that trickle from the flanks of the great mountains and the banks of snow that never melt.

The waters in all these streams were clear and cold, and food was abundant. Some of the streams that came in from the east and others from the west already had formed considerable falls in their course above which the trout were not able to go. In some of the tributaries, such barriers were met with in the beginning and those streams are barren of fish to this day. In others, the invasion from the main stream began and was consummated before the falls became impassable, and trout are now found in them, although falls which fishes can not surmount have since been formed in many of them. Among tributary streams of this character which may be mentioned are Soda Creek, Coyote Creek, and the Little Kern on the west and Volcano Creek and South Fork of Kern River on the east. In the first three, the wearing down of the stream bed and the formation of impassable falls prevented any subsequent invasions from the main river, isolated those colonies of trout which had pushed toward the headwaters, and prevented any further mixing of creek fish with river fish. But in Volcano Creek the conditions were exceptional and complicated. This stream derived its fish originally from Kern River, as did the other streams mentioned; impassable falls subsequently formed and the fish of the creek became shut off from those of the river. Then an unique factor was introduced. A period of volcanic activity ensued, during which the west half of the Toowa Valley was more or less filled with lava, volcanic tufa, and other igneous material, the lower half of Volcano Creek was for a time wiped out of existence, and every living thing in its waters below the tunnel killed. The only fishes of Volcano Creek that escaped this catastrophe were those individuals which had migrated well toward the headwaters

of the stream above the influence of the lava flow. But this creek was permanently shut off from any further invasions of trout from the river; and when its waters again began to flow to the Kern, the falls then formed were even greater barriers than before, and the trout of Volcano Creek became more thoroughly isolated.

The environment of Volcano Creek is very different from that of Kern River; it is that of a small stream, with clean gravelly granite bed in its upper and yellowish or blackish lava and yellowish tufa in its lower course, and with water clear, pure, cold, and turbulent. Contrasted with this is Kern River, a large stream, many yards wide and many feet deep, with current often sluggish and bed of fine sand or mud in many places.

These different environments were sure in time to modify and differentiate the fishes of the two streams. The law of cause and effect applies here as elsewhere in nature, and with equal force; different causes acting upon even the same thing will produce different results.

But geographical isolation (räumliche Sonderung) is the great primary factor in the production of new species. It is the potent agent which holds apart the two groups of individuals, preventing intermingling and confining each to the influences of its own peculiar environment.

In the production of new species in nature, it is not essential that the environments be greatly unlike, or unlike at all, if the groups of individuals being acted upon can be kept from interbreeding.

And thus the trout in Kern River and those in Volcano Creek went on developing, each group in its own way, the two becoming more and more unlike and acquiring structural and other characters by means of which the two forms may be readily distinguished. The trout of Volcano Creek has taken on characters not possessed by the trout of any other stream—very different indeed from those of the Kern River trout. These characters have become fixed, as is evidenced by the fact that they are essentially uniform among all the individuals of this creek. The Volcano Creek trout is therefore a different species from that found in Kern River.

As a result of the formation of impassable falls in the South Fork of the Kern, in the Little Kern, in Coyote Creek, and perhaps still other tributaries of the Kern, other colonies of trout that had invaded the headwaters of these streams became isolated, and in time they also became specifically distinguishable from those of the main Kern and all other streams, so that we now have, as already stated, four distinct species in the Kern River basin. They are the three species of Golden Trout, and the Kern River Trout which is the parent species from which the various species of golden trout have been independently derived.

LITTLE KERN GOLDEN TROUT.

Salmo whitei Evermann.

Other names: Coyote Creek Golden Trout, Soda Creek Golden Trout, White's Golden Trout.

Description: Head 3.72 in length; depth 4.68; eye 4.54 in head; snout 3.13; maxillary 1.72; mandible 1.66; interorbital 3.17; longest dorsal ray 2.08; longest anal ray 3.17; pectoral 1.66; ventral 2.17; caudal lobes 1.61. Body rather stout, moderately compressed; head conic; mouth large, oblique; jaws subequal; maxillary long and slender, reaching much beyond the eye; teeth on jaws,

5 rows

tongue and palatines well developed, caudal peduncle deep, its least depth about equal to distance from tip of snout to middle of eye. Fins well developed; origin of dorsal somewhat nearer tip of snout than base of caudal fin; insertion of ventral about under middle of dorsal fin. Scales small, but noticeably larger than in the Volcano Creek trout.

Color in life, back and upper part of side light olive; side and back profusely covered with small roundish black spots, these extending on top of head, vertical fins, and on side below lateral line; side with 10 large roundish parr-marks and a broadish median band of light-brick or terra-cotta red; lower part of side light lemon-yellow with a number of bluish-black blotches, chiefly anteriorly, somewhat larger than similar ones on back; belly from tip of lower jaw at anal fin rich orange-red or cadmium, richest between pectoral and ventral fins, this band the full width of the belly; no red dash on throat; suborbital pale rosy or purplish; cheek brassy, with a large dark blotch; opercle rosy orange olivaceous above; dorsal fin with about five rows of small round black spots and a black border except anteriorly, where the rays are tipped with a light-rosy border; pectoral light yellowish; ventral and anal reddish, with broad white edge; caudal profusely spotted with black like the dorsal fin. In spirits all the bright colors fade, but the black spots remain distinct. These spots are largest on the caudal peduncle, over which they are evenly distributed. They are also pretty evenly distributed over the entire side and top of head; the space along the lateral line, however, has fewer spots. Those below the lateral line extend more than halfway to the belly and are somewhat smaller than those above. About 14 spots show on side of head.

There is not much variation in color, as shown by examination of many examples. In all, the black spots completely cover the caudal peduncle and the entire length of side from median line of back to some distance below the lateral line; the top and sides of the head are always spotted. The middle line of the side and the belly are always richly colored, the parr-marks always present, and the dorsal, anal, and ventral fins bright-edged. No conspicuous red dash was observed on the lower jaw in any of the specimens from South Fork of Kaweah, Soda Creek, or Wet Meadow Creek, but among those from Coyote Creek were some showing considerable color.

Marks for field identification: The presence of small black spots on top of head and all but the lower one-third of the side distinguishes this golden trout from the two other species of golden trout.

Distribution: Soda Creek; Coyote Creek; Wet Meadow Creek; Little Kern River. The headwaters of the South Fork of the Kaweah were originally without trout but were stocked with fish from Soda Creek at Quinn's Horse Camp, and this species may, therefore, very properly be called the Soda Creek Trout.

This fish is known to reach a length of about ten inches. It takes the fly readily, and is a good fighter. Though less brilliant in color than the golden trout of Volcano Creek, it is in every respect a beautiful and attractive fish.

The following interesting account of the trout of the small streams of the High Sierras, by H. W. Henshaw, and written many years ago, applies chiefly to this species:

"This is the common brook trout of the small mountain streams of the Pacific slope, and up to an altitude of 9,000 feet it is the rare exception to find a suitable stream that is not well stocked with it. Upon many of them these trout are found in very great abundance, each pool and rapid numbering its finny denizens by the score. They may be taken in any sort of weather, at any hour of the day, by almost any kind of bait. During the heat of the day they frequent almost entirely the deeper pools, lying under overshadowing rocks or in the shade of some convenient log. In early morning or late afternoon they come out and run more into the shallows and rapids, under which circumstances they bite best and afford the finest sport. Like the average brook trout the species rarely attains any considerable size, ranging from four to eight or more inches in length. The character of the

bottom and water itself has much to do with color and I remember to have fished in a small rivulet on one of the subalpine meadows not far from Mount Whitney, whose sluggish waters flowed over a bottom of dark mud, in which the color of the trout simulated very closely its hue; they had lost nearly all the flashing irridescent tints characterizing the same species caught but a few hours before in another stream, and had become dull and somber-hued. Accompanying this change of color was a correspondingly noticeable difference in the habits and motions, and the several dozen trout caught that evening for supper were taken out by the hook with the display of very little more gaminess than would be noticed in so many horned pout. On the contrary, in the clear rapid current of the mountain stream, a flash of sunlight is scarcely quicker than the gleam of gold and silver, seen for a single instant, as the whirling waters are cut by one of the trout as he makes a rush from his lurking place for some chance morsel which is being borne past him. The Western trout are rarely as shy as their relatives of Eastern waters, and because of their numbers and consequent scarcity of food are apt to be less fastidious; yet even when most abundant due caution must be used if one would be successful, and not every one can catch trout even in the West. With the proper care in concealing one's self a pool may be almost decimated ere the alarm will be taken, and I have seen fifteen fair sized trout taken from a single small pool in quick succession."

This beautiful trout was named in honor of Stewart Edward White who suggested to President Roosevelt the investigation which resulted in its discovery.

SOUTH FORK OF KERN GOLDEN TROUT.

Salmo agua-bonita Jordan.

Other names: Mount Whitney Golden Trout; Golden Trout; Agua-bonita Golden Trout; *Salmo iridcus agua-bonita.*

Description: Head 3.68 in length; depth 3.85; eye 4.4 in head; snout 4.4; maxillary 2.09; mandible 2.00; interorbital 3.66; longest dorsal ray 2.09; base of dorsal 1.8, longest anal ray 1.69; pectoral 1.63; ventral 2.09; caudal lobes 1.46; base of anal 2.1. Body stout, moderately elongate, head short, snout blunt; mouth moderate, maxillary extending somewhat beyond orbit, relatively broader than in the Kern River trout; teeth on jaws, maxillary, palatines, and vomer well developed, fins moderate; caudal peduncle compressed, its least depth equal to distance from tip of snout to posterior edge of pupil; scales relatively large.

Color in life, back and upper part of side light olivaceous; entire body above lateral line, including head, sparsely covered with rather large roundish black spots, those extending below lateral line on caudal peduncle; spots on side anterior to dorsal in usually few, usually a few spots on median line of back between origin of dorsal and head; snout and top of head usually with a few spots; 2 or 3 spots sometimes on side of head; middle of side with a somewhat distinct rosy band, plainest at middle; part-marks always present; side below lateral line light golden yellow; belly scarlet, brightest from ventral halfway to isthmus; under side of head, except jaw, reddish orange; cheek light golden yellow anteriorly, rosy or coppery posteriorly; dorsal and anal fins profusely spotted, the other fins with no spots, the anal dusky, adipose fin with edge black, and 2 small black spots; anterior dorsal ray tipped with reddish orange; ventrals and anal red, tipped with orange white; pectoral bronze. The above description chiefly from a specimen 7.75 inches long.

An examination of numerous examples shows some slight variations in the colors. The part-marks are sometimes less regular, and the exact shade of the bright lateral band and the color of the belly vary somewhat. These, however, are simply differences in intensity rather than in pattern.

Marks for field identification: In this species the extent of the spotting on the body is the best diagnostic character. The South Fork of Kern trout are almost invariably well spotted, not only on the caudal peduncle but also along the side above the lateral line, at least as far forward as the front of the dorsal fin. There are also usually a few spots on the anterior part of side. And along median line of back between dorsal and head, snout and top of head spotted, and usually a few spots on side of head; but there are no spots below the lateral line except on the caudal peduncle.

Distribution: South Fork of Kern River from which it has been introduced into the Cottonwood Lakes and Cottonwood Creek, and doubtless other streams.

This species was originally described by Dr. David Starr Jordan in 1893. His description was based on three small specimens conveyed to him by Mr. W. H. Shockley of San Francisco to whom they had been sent by Mr. George T. Mills, state fish commissioner of Nevada, who in turn had received them from Mr. A. C. Harvey of Lone Pine, Inyo County, California. A memorandum accompanying the specimens stated that they had been "taken by Mr. Harvey of Lone Pine, California, in a stream called by him 'Whitney Creek' [more correctly Volcano Creek], on the west side of the Sierras near Mount Whitney." It has since developed that these specimens did not come from Whitney (Volcano) Creek, but from Cottonwood Creek, a stream on the east side of the mountains and tributary to Owens Lake. Cottonwood Creek was stocked in 1876 by Messrs. A. C. Stevens, S. V. Stevens, and Thomas George with trout obtained by them in Mulky Creek, a small tributary of the South Fork of the Kern in Mulky Meadows, about 3½ to 4 miles from Cottonwood Creek. It is therefore evident that the specimens upon which Dr. Jordan based his description of *Salmo aquabonita* were descendants of the trout from Mulky Creek transplanted into Cottonwood Creek in 1876 and are therefore the same species as that of the South Fork of the Kern. A comparison of specimens taken in the latter stream in 1904 with the type and cotype of *Salmo aquabonita* shows them to be specifically identical.

ROOSEVELT TROUT.

Salmo roosevelti Evermann.

Other names: Volcano Creek Golden Trout; Golden Trout of Golden Trout Creek; Golden Trout; Golden Trout of Volcano Creek.

Description: Head 3.5 in length to base of caudal fin; depth 4; eye 5.6 in head; snout 3.4; maxillary 1.8; longest anal ray 1.9; pectoral 1.8; ventral 2.1; caudal lobes 1.8; base of dorsal 1.9; base of anal 2.6; least depth of caudal peduncle 2.6. Body stout, moderately compressed; head conic, rather long; snout long; jaws subequal, mouth large, somewhat oblique, maxillary long and narrow but slightly curved, extending much beyond orbit; teeth well developed mandible, maxillary, palatines, front of vomer and on front of tongue, the latter in two rows; caudal peduncle very stout. Fins all strong and well developed; origin of dorsal midway between tip of snout and base of caudal peduncle; base of ventrals under middle of dorsal; caudal broad, strong, little notched when fully spread, and with its free edge somewhat falcate. Scales exceedingly small, smaller than in any other known species of trout, nonimbricated, and scarcely showing unless dry; there are about 50 in an oblique series from front of dorsal downward and backward to the base of the ventrals; there are about 206 scales in the lateral line, 146 to 150 of them having pores.

Color in life, back, top of head, and upper part of side very light yellowish olive; middle of the side from gill-opening to adipose fin with a broad bright rosy band, the greatest width of which is about equal to greatest diameter of orbit; side below lateral line bright golden yellow, fading below into yellowish white; belly with a broad cadmium or deep orange-red band from throat to anal fin, the color deepest between pectoral and ventral; some red on belly between

origin of anal and base of caudal; about 10 roundish or vertically oblong parr-marks on middle of side, upon which apparently the rosy lateral band is superimposed, 3 of these parr-marks are on the caudal peduncle posterior to the adipose fin, 2 between the adipose and dorsal fins, 2 under the dorsal, and 3 anterior to it; between the first and second large parr-marks and somewhat below them is a small round spot of the same color, and there is a similar one between the fifth and sixth spots; cheeks and opercles bright rosy, edged posteriorly and below with yellowish, an olivaceous blotch on upper part of cheek and a small black spot on upper part of opercle; region about eye olivaceous yellow, especially below; lower jaw rosy, with some yellowish membrane between rami of lower jaw whitish without rosy wash, tip of lower jaw olivaceous; mouth on sides and below tongue orange, whitish elsewhere; side of caudal peduncle with about 20 small roundish black spots, these most numerous on posterior half, there being only 3 anterior to the adipose dorsal fin; rest of body entirely without spots; dorsal fin with about 6 irregular series of small roundish black spots, those toward the distal portion largest and blackest; general color of dorsal fin light olivaceous yellow, the tips of the anterior rays with a broad margin of whitish orange; adipose dorsal olivaceous, narrowly bordered with black, and with 2 small round black spots; caudal fin profusely spotted with black, the spots arranged irregularly in about 8 or 10 vertical rows; those at the base blackest and roundest, those on the distal edge somewhat linear, those on the outer edges of the lobes extending forward onto the dorsal and ventral lines of the caudal peduncle; general color of caudal fin yellowish and olivaceous, the lower lobe somewhat rosy; pectoral red, somewhat lighter than lateral band; ventral reddish, the anterior rays edged with white; anal reddish with a little orange, the anterior half or two-thirds broadly edged with white.

There is not much variation in color, except such as is probably due to difference in age; the rosy lateral band, the parr-marks and the broad rich cadmium band on the belly are characteristic. The variation in the black spots is inconsiderable. In the 29 specimens which the senior author has examined critically 15 do not show any spots whatever anterior to the adipose fin, and only 2 of the remaining 14 show any spots anterior to the dorsal fin, and these are obscure and few in number. In one large specimen there are but 12 to 14 spots on the caudal peduncle, in another somewhat smaller example there are but 6 spots. The dorsal, anal, and ventral fins are invariably edged with color. The head in the males is longer and more pointed; the maxillary is also longer than in the females.

When well spread the caudal fin is usually slightly lunate or slightly notched, but in some examples it is almost truncate or square. In alcohol all of the bright colors soon fade, the parr-marks, black spots and pale edges to the dorsal, anal and ventral fins persisting. The general color of the body then becomes a dirty yellowish white or in some specimens brownish. In some cases the parr-marks almost wholly disappear.

Marks for field identification: The rich rosy lateral band showing through the large distinct black parr-marks, the rich lemon yellow of the lower half of the sides, the intensely rich cadmium of the belly, and the entire absence of black spots on the body except on the caudal peduncle, readily distinguish the Roosevelt trout from all other species.

Distribution: The golden trout is native to Volcano Creek alone, and occurs throughout the entire length of that stream. It is found at all places from above the tunnel to below the lowermost of the series of falls near the mouth, and in all suitable places from the tunnel to the headwaters above Volcano Meadows, where the elevation is more than 10,000 feet.

Trout are abundant in Volcano Creek; every pool at the foot of a fall or below a cascade or rapid is sure to contain a number of them, and they may be seen on the riffles and under the protecting banks. Although the fish runs down Volcano Creek even to below the lowest falls, it apparently does not venture out into Kern River; no examples were seen there. It is a creek fish and appears to keep within the peculiar environment of the small stream. They are most numerous above the tunnel, probably because fewer tourists visit that portion of

the stream. The fish there, however, are usually small. The largest, finest examples are found between the natural bridge and the lower falls.

As a game fish the golden trout is one of the best. It will rise to any kind of lure, including the artificial fly, and at any time of day. A No. 10 fly is large enough, perhaps too large; No. 12 or even smaller is much better. In the morning and again in the evening, it will take the fly with a rush and make a good fight, jumping when permitted to do so; during the middle of the day it rises more deliberately and may sometimes be tempted only with grasshoppers. It is a fish that does not give up soon but continues the fight. Its unusual breadth of fins and strength of caudal peduncle, together with the turbulent water in which it dwells, enable it to make a fight equalling that offered by many a larger trout.

Although now abundant the golden trout can not long remain so unless afforded some protection. The attractiveness of the Kern River region because of its scenic beauty is sure to appeal more and more to tourists every year. Practically the entire length of Volcano Creek is easily accessible from the trail from the east side of the divide. As a matter of fact, one can in one day travel the entire length of the creek and have time to stop frequently to drop a fly into the pools which he passes. The trout are readily found and easily captured, as they are so voracious and rise to the lure so readily.

The great beauty of the Roosevelt trout lies in the richness of its colors and in its trimness of form; the brilliancy and richness of its coloration is not equaled in any other known species of trout. The delicate golden olive of the head, back, and upper part of the side, the clear golden yellow along and below the lateral line, overlaid by a delicate rosy lateral band, and the marvelously rich cadmium of the under parts, fully entitle this to be known above all others as *the* golden trout. Except on the caudal peduncle, the body is entirely without the black spots characteristic of the rainbow trout series. One can appreciate to some extent the great beauty of this fish by examining the splendid painting by Hudson.

In form it is no less beautiful; its lines are perfect, the fins large and well proportioned, and the caudal peduncle strong; all fitting it admirably for life in the turbulent waters in which it dwells. It is a small fish, however. It is probable that it never attains a greater length than 14 inches or a weight of more than a pound in Volcano Creek. In the Cottonwood Lakes it is said to reach a weight of five pounds.

The scales are smaller than in any other known species of trout. They are so small, indeed, as to have caused so good an observer as Stewart Edward White to declare that this trout has no scales at all. This is an error in observation that is not uncommon; even James Russell Lowell, excellent naturalist that he was, wrote:

> "One trout scale in the scales I lay
> (If trout had scales), and it will outweigh
> The wrong side of the balances."

But all trout have scales, albeit often very small and not easily seen except by him who knows fishes, and the golden trout scales are the smallest of them all.

This, the most beautiful trout in all the world, was named in honor of Theodore Roosevelt, the naturalist, who, as President of the United States, ordered the investigation which resulted in its discovery as a new species.

Cutthroat Series.

CUTTHROAT TROUT.

Salmo clarkii Richardson.

Other names: Black-spotted Trout; Columbia River Trout; Clark Trout; Red-throated Trout.

Description: Head 4; depth 4; D. 10; A. 10; cæca 43; scales small, in 150 to 170 cross-series. Body elongate, compressed; head rather short; mouth moderate, the maxillary not reaching far beyond the eye; vomerine teeth as usual set in an irregular zig-zag series, teeth on the hyoid bone normally present, but often obsolete in old examples; dorsal fin rather low; caudal fin slightly forked (more so in young). Color, silvery olivaceous, often dark steel color; back, upper part of side and caudal peduncle profusely covered with rounded black spots of varying sizes and shapes, these spots often on the head, and sometimes extending on the belly; dorsal, adipose, and caudal fins covered with similar spots about as large as the nostril; *inner edge of the mandible with a deep-red blotch*, which is a diagnostic mark; middle of side usually with a diffuse pale rosy wash, sometimes quite bright, and extending on side of head; under parts silvery white. The red blotches or washing on the membrane joining the dentary bones of the lower jaw are usually constant, probably always present in the adult, and constitute a most important character. (Jordan and Evermann)

Marks for field identification: Red marks on throat; very small scales, there being about 150 in a row from head to tail; back profusely spotted; teeth present on hyoid bone at base of tongue.

Distribution in California: Pit River and tributaries, Eel River, coastal streams of northwestern California, Goose Lake.

Spawns in spring. Decidedly a deepwater fish, except during spawning season when it seeks shallower waters. Cutthroats do not rise as readily to a fly as other trout, but more often take a sunken fly; nor do they seek swift water as the rainbow. As a rule, this species does not rank with others in its gameness. Apparently, the cutthroat in this state is not as prolific as the rainbow; at least this species is not nearly so abundant as the rainbow. The cutthroat spawns in the spring and early summer, ascending to the headwaters of streams or depositing eggs in shallow water or on sand bars in the lakes. Lake cutthroats invariably reach a larger size than stream fish. Specimens in the Klamath Lakes have reached a weight of seventeen pounds.

TAHOE TROUT.

Salmo henshawi Gill & Jordan.

Other names: Black-spotted Trout; Silver Trout; Redfish; Tommy; Black Trout; *Salmo tahoensis*; *Salmo purpuratus henshawi*; *Salmo mykiss* (in part); *Salmo mykiss henshawi*; *Salmo clarkii henshawi*.

Description: Head 3.75; depth 4; D. 11; A. 12; scales 27 to 37, 160 to 184-27 to 37, usually about 170 in a longitudinal series; body robust, elongate, greatest depth about one-fourth of total length without tail; caudal peduncle about two-fifths length of head; head long, conical, slender, not extending far behind eye; two long series of vomerine teeth; caudal short and distinctly forked; dark olive-green above, covered almost entirely with large black spots, males a dark yellowish olive color, with metallic reflections, the dark color being the same

from the back to the ventral surface; a broad, pinkish, indefinite stripe about 10 scales wide on the side, each scale included in this stripe and also in a broad area above and below slightly edged with light yellow; opercle, preopercle, subopercle, and a triangular spot above the axil of pectoral, scarlet or yellowish scarlet; under surface of lower jaw with two parallel stripes of red; red also visible on the tongue and on the shoulder girdle; brownish black spots distributed over the entire body; females usually more lightly colored and the colors seeming to have more metallic luster.

Marks for field identification: The dark olive body with many bold black spots widely scattered almost uniformly over its entire surface, and the red marks on the throat distinguish the Tahoe trout. Sometimes it has a silvery luster. Although plainly belonging to the cutthroat series, having the same red dashes under the throat, long head, small scales and teeth on the tongue, it is nevertheless, browner or yellower in color, and has larger scattered spots which cover the whole fish.

Distribution: Lake Tahoe and its tributary streams and lakes; upper portions of the Truckee River, Donner, Webber and Independence lakes; introduced in lakes of Siskiyou County, and Bear Lake, San Bernardino County, and in the Stanislaus and the Mokelumne rivers on the western slope of the Sierras.

Anglers usually point out the following different kinds of trout in Lake Tahoe and the Truckee River:

Tahoe Trout, dark in color with large spots.

Silver Trout, silvery in color, with small, elongate spots; body deep and heavy.

Redfish, brilliant in color, with red cheeks.

Tommy, small, relatively large spotted fish, spawning later than the redfish.

Royal Silver Trout, deep blue above and silvery on sides with few or no spots. (*Salmo regalis.*)

Even though known to fishermen, these forms with the exception of the royal silver trout are here all classed as Tahoe trout, until further information is available.

There has been a great deal of speculation over the identity of the redfish, a large brightly-colored fish with a red cheek spot, which runs up the Truckee River early in spring, the migration ceasing in March. By many this is regarded as entirely distinct from the Tahoe trout. With the conclusion of this run of fish there appears a run of smaller fish known to the anglers as tommies. This second migration usually occurs in April and is about over by May 1. The tommy is a smaller and relatively large spotted fish. Whether these two forms which have separate spawning seasons are one and the same fish is yet to be determined, but at present they are given the same name. (Snyder.)

Frequently, a very light-colored silvery example of Tahoe trout is taken, its sides having a bright metallic luster and smaller and more elongate spots. This is usually known as the silver trout, and is said to frequent the greater depths. It attains a very large size, one having been caught which weighed 29 pounds. This form was described by Jordan and Evermann as *Salmo tahoensis* and may be, as they thought, a distinct species.

During a portion of the year the Tahoe trout lives in deep water, and can be caught, if at all, only on long lines. Early in the spring

and in the summer they are to be found in relatively shallow water. It may be that food supply accounts for this migration from deep to shallow water, as spawning minnows seem to be the attractive food when the trout is in shallow water. The greater number of this species are taken by trolling with a spoon. (Snyder.)

The Tahoe trout appears to feed largely on minnows but black ants and other insects are taken in quantity.

ROYAL SILVER TROUT.

Salmo regalis Snyder.

Other names: Greenback; Grayback.

Description: A fresh specimen is characterized by a deep steel blue on the dorsal surface which color extends downward on the sides to about the sixth row of scales above the lateral line, where it abruptly blends into a silvery hue. The silver dulls ventrally, while the chin, throat, and abdomen are white. The cheek is marked by a faint red or yellow spot glowing faintly through the silver, but this is the only red or yellow color on the fish. The dorsal and caudal fins are the only portions of the body marked by dark spots, but even these are inconspicuous. It has about 144 to 150 lateral series of scales, 29 to 31 above the lateral line, 11 to 13 branchiostegals, and 19 to 21 gillrakers. No external sex differences can be observed. (Snyder)

Marks for field identification: The Royal Silver trout, easily confused with silvery specimens of the common Tahoe trout (*Salmo henshawi*), differs from the latter in its decidedly silvery sides, blue back, shorter head, shorter and more rounded snout, smaller maxillary, large scales, narrow and more pointed fins, perfectly smooth last branchials which are without teeth, and fewer gillrakers. The absence of spots is also characteristic.

Distribution: Known only from the Lake Tahoe basin.

Little is known about its habits, but apparently it does not spawn in streams tributary to Lake Tahoe, as does the Tahoe trout. Feeds largely on insects, but doubtless also takes minnows, as it has been caught on a spinner.

Native Charrs.

DOLLY VARDEN TROUT.

Salvelinus parkei (Suckley).

Other names: Malma; Salmon Trout (Alaska and Montana); Bull Trout (Idaho); Western Charr; Oregon Charr; *Salvelinus malma* (in part).

Description: Head 3.5 to 3.75; depth 4.8 to 6; eye 6.5 to 7; snout 3 to 4; maxillary 4.7 to 5; D. 11; A. 9; scales 29-240-36; pyloric cæca large, 45 to 50; gillrakers about 8 to 12. Body rather slender, the back somewhat elevated, less compressed than in *Salvelinus fontinalis*; head large, snout broad, flattened above, mouth large, the maxillary reaching past the eye; fins short, the caudal slightly forked or almost truncate. General color, olivaceous, the sides with round red or orange spots nearly as large as the eye, the back with smaller but smaller spots and without reticulations, a feature of coloration which at once distinguishes this from all other American trout; lower fins colored much as in *S. fontinalis*, dusky with a pale stripe in front, followed by a darker one. (Jordan and Evermann.)

Marks for field identification: Distinguished from true trout and from other charrs by the lack of reticulations or mottling in its color pattern. Large orange or red spots on the back as well as sides, and the lack of blackish markings on the upper fins, distinguish it from the Eastern Brook trout. It may weigh, when mature, anywhere from six ounces to twelve pounds. The little ones are brightest in color.

Distribution: The only stream in California in which the Dolly Varden trout is known to be a native is the McCloud River.

The Dolly Varden is more voracious than the true trout. In Alaska streams it devours millions of salmon eggs, as well as young salmon and this fish is the greatest enemy the salmon breeder finds. Gamy and vigorous, it makes a fair game fish, taking a baited hook freely. They also rise readily to the artificial fly. Their food is principally minnows. In California, the Dolly Varden is largely nonmigratory. It lies on the bottom and waits for food to come to it, then grabs it like a mad bulldog. When caught it will often actually attempt to defend itself by biting. Moreover, it will live longer out of water than other trouts.

When this fish was taken by scientists in the McCloud River, the resemblance to a dress goods with spots called Dolly Varden and which was then the rage, led to its being given this name by the lady members of the party, and "Dolly Varden" it has been ever since.

Fig. 13. Dolly Varden trout (*Salvelinus parkei*). A charr, not a true trout, found in this state only in the McCloud River.

Introduced Species.

EASTERN BROOK TROUT.

Salmo fontinalis (Mitchill).

Other names: Brook Trout; Speckled Trout; Fontinalis.

Description: Head 4.5; D. 10; A. 9; scales 37-230-30; gillrakers about 6 + 11; body oblong, moderately compressed, not much elevated; head large, but not very long, the snout bluntish, the interorbital space rather broad; mouth large, the maxillary reaching beyond orbit; eye large, somewhat above axis of body; caudal fin slightly lunate in the adult, forked in the young; adipose fin small; pectoral and ventral fins not especially elongate. Color, back more or less mottled, marbled, or barred with dark olive or black, without spots; red spots on side rather smaller than the pupil; dorsal and caudal fins mottled with darker; lower fins dusky, with a pale, usually orange, band anteriorly, followed by a darker one; belly in the male often more or less red. (Jordan and Evermann.)

Marks for field identification: Small imbedded scales making the fish appear scaleless; mottled or marbled color pattern of back with no spots, and red lower fins fringed with white, are the best distinguishing features.

Distribution: Tahoe region, Sierran lakes and streams; planted in most streams from Siskiyou to San Diego County, with the exception of the coastal streams. This fish now has the widest distribution, in California, of any introduced species.

Eastern brook trout abound chiefly in cold, slow-running meadow brooks; but they thrive in all pure cold waters which contain sufficient

From drawing by Charles Bradford Hudson

EASTERN BROOK TROUT *(Salvelinus fontinalis)*

air, including lakes and ponds. Never, in California, are they found in fast-rushing mountain streams. This fish is wary, and great skill is required in catching it. The outstanding peculiarity of its habits is evidenced by the fact that a person acquainted with its haunts can go out and catch a string of Eastern brook in a comparatively short time, while others, with better tackle and equal skill, will fish a whole day for them in vain. The largest brook trout are found in the deep, wide pools in the warmer waters; the smallest ones are found in the cold, narrow mountain rivulets near their source. Eastern brook trout do not keep well nor ship well, probably on account of the fat. They spawn high up in the tributary streams and so early (October to January) that eggs for hatchery purposes are almost impossible to obtain. This trout is a nest-builder. "Cavities are made in gravel, the nest is shaped with the tail. * * * After the eggs are deposited they are covered with gravel. The egg is about one-fifth of an inch in diameter, and varies in color from pale lemon to orange red. The average yield of the female is from 400 to 600. The period of hatching will depend on the temperature, ranging from 165 days in water of 37 degrees to 32 days in water of 54 degrees. The yolk sack is absorbed in from 30 to 80 days, and after its absorption the young fish begins to feed. The rate of growth will, of course, depend on the amount of food consumed. In artificial culture yearlings, according to Mr. Ainsworth's estimate, will average 2 ounces; fish of two years, 4 ounces; of three years, 8 ounces, and of four years, 1 pound." (Bean.)

History. The California Fish Commission purchased 6,000 Eastern brook trout in 1872, and distributed them equally in the North Fork of the American River, in the headwaters of Alameda Creek, and in the San Andreas reservoir, near San Francisco. In 1875, a large shipment of eggs, 60,000, was received from New Hampshire and succeeding shipments in 1877, 1878, and 1879. Beginning in 1890, large numbers have been hatched and distributed each year. More recently, eggs for the hatcheries have been secured from the Marlette-Carson hatchery in Nevada.

BROWN TROUT.

Salmo fario Linnæus.

Other names: von Behr Trout; European Brown Trout.

Description: D. 13-14; A. 10-11; P. 13; V. 9. Scales 25-29-36; pyloric cæca 38-54; vertebræ 57-58. Body short and stout, its greatest depth being contained about four times in the length without the caudal. The caudal peduncle is short and deep, its depth equal to two-fifths of the length of the head. Length of head is one-fourth of total length without caudal. Dorsal fin is nearer to tip of snout than to root of tail; longest ray of this fin equals the distance from the eye to the end of the opercle. Ventral is under the posterior part of the dorsal; its length is about one-half that of the head. The adipose dorsal is over the end of the anal base. Pectoral nearly one-sixth of length without the caudal. In the male the jaws are produced and very old ones have a hook. The maxilla extends to the hind margin of the eye. On head, body and dorsal fin are numerous red and black spots, the latter circular or X-shaped and some of them with a pale border, yellowish margin usually present on the front of the dorsal and anal and the outer part of the ventral. The dark spots are few in number below the lateral line. The ground color of the body is brownish or brownish black, varying with food and locality. (Bean.)

Marks for field identification: The back and sides of this trout are decidedly brown, the back is covered with black spots and the sides with red spots. The belly is silvery white or brownish. This trout is not easily confused with others

Distribution: A pure strain is to be found in the Yosemite Valley region; streams of northern Humboldt and Lake County. Hybrids, the result of a cross with the Loch Leven, are found in many other streams in the state.

The brown trout lives in clear, cold, rapid streams and at the mouths of streams tributary to lakes. It grows to be of large size; maturing at about 8 inches in length. In its movements it is swift, and it leaps over obstructions like the salmon. It feeds usually in the morning and evening, is more active during evening and night, and often lies quietly in deep pools or in the shadow of overhanging bushes and trees for hours at a time. Insects and their larvæ, worms, mollusks, and small fishes

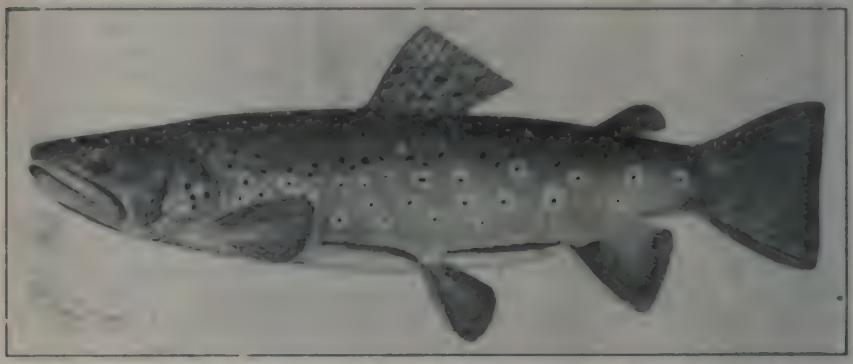

Fig. 44. Brown trout (*Salmo fario*) introduced into California about 1895. **Now distributed widely in our state.**

form its food, and, like its relative, the rainbow trout, it is fond of the eggs of fishes. Spawning begins in October and continues to January. Eggs are deposited in crevices between stones, under projecting roots of trees, and sometimes in nests excavated by the spawning fishes. The parents cover the eggs to some extent with gravel. (Bean.)

History. Several plants of brown trout were made by the United States Bureau of Fisheries previous to 1895, but in that year 135,000 were reared at the Sisson hatchery. With the exception of those held in the breeding ponds these fish were planted in the lakes and streams of the high Sierras.

LOCH LEVEN TROUT.

Salmo trutta levenensis Walker.

Other names: *Salmo levenensis;* Scotch Trout.

Description: D. 13; A. 12; P. 14; V. 9. Scales 24 to 28—118 to 130—26-30; pyloric cæca 47-99; vertebræ 56-59. Body slender and elongate, its greatest depth contained four and one-fourth to four and one-half times in total length without caudal. Caudal peduncle slender, its least depth three-eighths of the greatest depth of the body, and equal to length of snout and eye combined. Head rather short and conical, its length two-ninths to one-fifth of the total length without caudal. The snout is one-fourth or slightly more than one-fourth as long as the head. The interorbital space is somewhat convex, its width equal to three-fifths of the length of postorbital part of head. The eye is of moderate size, its long diameter contained five and one-half to six times in the length of the head, and equalling about twice the greatest width of the maxilla. Maxilla reaches to or slightly beyond the hind margin of the eye. Teeth rather strong, those in the intermaxillary and mandible the largest, triangular head of vomer with two or three in a transverse series at its base,

teeth on the shaft of the vomer usually in a single, partially zig-zag, persistent series. Mandible without a hook and little produced even in breeding males. Dorsal origin distant from tip of snout about as far as end of dorsal base from base of caudal; the dorsal fin higher than long, its longest ray equal to longest ray of anal fin. The anal fin is much higher than long, its distance from the base of the ventral equaling length of the head. The ventral origin is nearly under the middle of the dorsal, the fin being as long as the postorbital part of the head. Pectoral equals length of head without the snout. Adipose fin very small, its width one-half its length, which is about equal to eye. Caudal fin emarginate unless fully extended, when it becomes truncate, the outer rays about one-seventh of total length, including caudal. (Bean)

Marks for field identification: The true Loch Leven trout is a slimmer fish than the brown trout, and the adipose fin is smaller. Furthermore, it is fully spotted and lacks the brown color of the brown trout. The sides are silvery with a varying number of X-shaped black spots or rounded brown or black spots.

Distribution: Webber Lake in Sierra County has pure original stock. Common to California streams: Feather River, Tahoe region, and Siskiyou County lakes and streams, but usually crossed with brown trout.

The spawning season may begin in October and continues till January. According to W. H. Shebley, the egg is slightly smaller (260 to a fluid ounce) than the egg of a rainbow (220 to a fluid ounce) but larger than that of an Eastern brook (345 and 400 to fluid ounce).

Fig. 45. Loch Leven trout (*Salmo levenensis*). A native of Scotland. Introduced into California in 1884 and now a common fish in Sierra streams, but often crossed with the brown trout.

This trout is largely nonmigratory in its native habitat. It takes the artificial fly readily. The food of this species includes fresh-water mollusks, crustaceans, worms, and small fish.

History. Twenty thousand Loch Leven trout eggs were received at the Sisson hatchery in 1894. Since that time plants have been made annually from the fry reared at this hatchery. Most of the fish in the breeding ponds at present are hybrids secured by crossing with the brown trout. Hybridization between these two species is very common.

MACKINAW TROUT.

Cristivomer namaycush (Walbaum).

Other names: Great Lakes Trout. Cristivomer, among the Canadian Indians called the "namaycush."

Description: Head 4.5; depth 4; eye 4.5; Br. 11 or 12; D. 11; A. 11; scales 185 to 205; maxillary 2; intercalibetal 4. Body long; head very long, its upper surface flattened; mouth very large, the maxillary extending much beyond the eye, the

head and jaws proportionately lengthened and pointed; caudal fin well forked; adipose fin small; teeth very strong. General coloration, dark gray, sometimes pale, sometimes almost black, everywhere with rounded pale spots which are often reddish tinged; head usually vermiculate above; dorsal and caudal reticulate with darker.

Marks for field identification: Largest of all trouts and known by its cream-colored or grayish spots instead of red spots as in the true charrs. The dorsal and caudal fins are marked.

Distribution: Introduced in Lake Tahoe, Fallen Leaf and Donner lakes, where it is occasionally caught.

Omnivorous in its feeding habits; it has a ravenous appetite, greedily devouring all kinds of fishes possessing soft fins. It is even said that jackknives, corncobs and other equally indigestible articles have been found in its stomach. It spawns on reefs and lives in deep water at other times. The spawning season begins late in September, and spawning continues until December.

The Mackinaw trout reaches a much larger size than a charr, specimens of from 15 to 20 pounds weight being not uncommon, while it

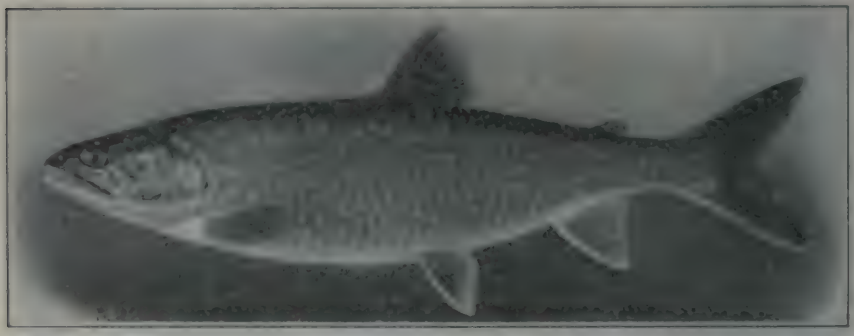

Fig. 46. Mackinaw trout (*Cristivomer namaycush*). A large trout native in the Great Lakes. Now occasionally taken in Tahoe region, where it was introduced in 1894.

occasionally attains a weight of 50 to 80 pounds in the Great Lakes. As a food fish it ranks high, although it may be regarded as somewhat inferior to the brook trout or the whitefish. Compared with other salmonoids, the Great Lakes trout is a sluggish, heavy, and ravenous fish. "According to Herbert, a coarse, heavy, stiff rod, and a powerful oiled hempen flaxen line on a winch, with a heavy sinker; a cod-hook baited with any kind of flesh, fish, or fowl—is the most successful, if not the most orthodox or scientific mode of capturing him. His great size and immense strength alone give him the value as a fish of game: but when hooked he pulls strongly and fights hard, though he is a boring, deep fighter, and seldom if ever leaps out of the water, like the true salmon or brook trout." (Jordan.)

History. First brought to California in 1894, the Mackinaw trout was propagated at the Sisson hatchery, and the following year 65,000 were planted in Lake Tahoe. In succeeding years additional plants were made in the Truckee basin. This fish has not thrived as well as other introduced species.

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Fig. 47. Planting fish in the High Sierras.

SUMMER ON THE CALIFORNIA TROUT STREAMS.

By ROBERT PAGE LINCOLN, Associate Editor of "Rod and Gun in Canada."

Trout fishing California has in plenty, with the added attraction of picturesqueness afforded by cool valleys, and overlooked by towering mountains. There is a wide variety to choose from; and that the sport is of the very best is annually attested by the experiences of thousands of the sons of Walton who hie them away for a try at the big fellows. They generally come back with what they went for, and some memories, too, that are enlivened with bright lights that are prone to linger long in the consciousness; on the other hand, it is doubtful if such memories ever pass out of one's hoard of recollections.

It is the pride of California to know that it has a native trout that has gone down to fame, and has taken up its home in practically every quarter of the world. Just how many of the people of the Sunny State are aware of this I do not know, but that brilliant clan, the California league of fly-rod men, are in understanding of it. The fish I have reference to is the rainbow trout (*Salmo irideus*), the most noble finny fighter that ever seized an artificial fly and made a leaping, dazzling flight through the waters. In the Eastern section of the country men speak volumes about the speckled brook trout, though each and every one of them end up, at some time or another, by telling of the fight that the rainbow trout puts up when captured. As an introduction into other waters, the native Californian, rainbow trout, has proven himself well able to take care of himself and to perpetuate his kind for the benefit of anglers. The rainbow trout is now found in the waters of the British Isles, in France, Germany and Russia. Exceptionally good rainbow trout fishing is to be had in the many rivers of South Africa. Anglers have written enthusiastically of fishing for *Salmo irideus* in the streams of New Zealand. In our own country the rainbow trout has had a wide distribution. Knee deep in the waters of Michigan and Wisconsin streams I have played this fighter—the pride of California; reared at the foot of the snow-capped mountains, in the heart of the Sierras. In the rage that swept the Eastern States over speckled brook trout fishing, a condition has arisen where practically every stream has been sapped of its spotted beauties. Where to turn for a replenisher? The rainbow trout is always the happy solution. There is not a properly-fitted trout stream that will not do for the rainbow trout. It grows fast. It fights well.

But it seems that only in the shadow of their beloved mountain home (as in the Sierras) do the rainbow trout give a befitting example of their sprightly dash and pugnaciousness. One who has tested the fighting leap and flight of a rainbow trout, in its own particular native waters, in the mountains, and has tested a fish of the same species in Eastern waters at once knows the difference. Still flowing, often quite warm, and often discolored streams (which the rainbow trout has been introduced into in the East) produce a slow-moving fish with little fight in him. Such fish speedily degenerate into gluttons, and keep themselves in the pools. Many of these hulking fellows finally get to hugging the bottom and rarely come to the surface to take a fly.

How different the mountain rainbow! Unused to warm water, like the brook trout, he demands the sweet, cold water. By reason of the swiftness of the mountain stream he has a vigorous "kick" to his tail. His fins are superlatively strong for breasting those crystal currents. When he takes your artificial fly he does not lazily rise to the surface to suck it in, but snaps it. A moment later he will turn a double or triple somersault and the fight is on. 'Ware of that light tackle! He is a match for you. Back and forth he will race from one edge of the stream to the other. He is cunning, too, and knows every log and obstruction in the stream. He will (if you do not watch out) snag your leader on a convenient boulder and there will be nothing left but the fragrant memory of what might have been. The mountain rainbow is a high flyer, with the guarantee of gameness linked with his name. It recalls the brilliant words of Charles Frederick Holder: "How that rainbow came at me; how it went repeatedly into the air; how I nearly fell overboard, are matters of personal history, and need not be dwelt upon; but for the first few seconds that living rainbow, which went pirouetting over the little river on its tail, throwing impossible aerial swings and leaps, filled a space in my imagination. Again and again the rainbow leaped, a silvery radiance flashing in the sunlight, dropping back to dash about the boat, to come in with a rush, faster than I could reel. * * *

"You have, perhaps, never seen a big rainbow fresh from the icy pools of its choice. Know, then, that this fish, this seven-pounder which I held upon the scales, was a thing of beauty, a joy forever beyond dispute. Its back was well sprinkled with ocelot-like black spots; the color a deep green, the lower surface silver, while over all seemed drawn a filmy gauze of old-rose fabric, of inexpressible delicacy and beauty, which was intensified along the median line in a band of pink and rose and other tints that produced all the colors of the rainbow, for truth, and gave this radiant creature rank among the birds of brilliant plumage."

Holder wrote of the large rainbow trout to be taken in the lakes and streams of northern California and southern Oregon. How skilful was this great California angling writer in telling the beauty of fishes, and the fascination in taking them! No one has equalled his efforts at word painting with black upon white.

When one speaks of rainbow trout in California one instinctively thinks of the Kern River, which finds its birth in the high Sierras. The waters from Mount Whitney pour into that beautiful stream, "a great, clear, green, swift stream, among the granite rocks, its waters slipping along like oil; a river with rippling shallows and deep, cold eddies, the perfect home of the trout." The Kern River is famed among anglers the world over. When anglers meet it is always: "Have you ever fished the Kern, of California?" If you have fished the Kern you are the center of a curious throng of interested listeners. Especially does the Kern River interest anglers in that some of the tributaries from Mount Whitney contain a trout that is one of the gentle wonders of this planet. I refer to the so-called golden trout. Professor Gilbert brought out the first specimens of this fish for identification. David Starr Jordan designated the fish *Salmo gilberti*. That was some twenty years ago. The fish was brought from Soda Springs on the

south fork of the Kern River. Later the isolated golden trout of Volcano Creek were designated as a species apart from the others, the scientific term being given them (*Salmo agua-bonita*).* This name was derived from the waterfall that separates the Volcano Creek from the rest of the world—that is, as far as coming and going concerns this trout. There are scientifically, three species of the so-called golden trout in the Mount Whitney waters; overcast in gold, the fins tinted in the purest orange with a nicely brushed-in orange colored stripe along the median line. The golden trout are an off-shoot of the rainbow trout; merely that changed environments have wrought a subtle transformation in their coloration, for the pigment cells of a trout are very sensitive to taking on a new coloration. If a stream bottom be of sand and gravel, and very bright, the fish attains to a silvery coloration. The golden trout owe their coloration to the color of the bottom of the stream they live in. "The rocks over which these streams flow," says Jordan, "are of bright granite and quartzite, gray and red. It is supposed that the color is protective, for the fish are colored like the bottom. To a bird looking into the stream, the deception is perfect. It is supposed (though no one knows) that the colors have been attained through natural selection. The redder the fish, the better its chance to escape the fishhawk and eagle. If this is not the cause of the color, no one can guess any other, and to escape its enemies through resemblance to natural objects is not a trait of the fish alone, but of hundreds of other creatures in these and other mountains. But whatever the cause, nothing in nature is more beautiful or more graceful than a golden trout, alive in these clear, icy, sun-lit waters."

The golden trout are trout of the high altitudes. Such trout rarely grow to length and breadth and weight. One rarely catches a true golden trout much over three-quarters of a pound in weight. They rarely go over twelve inches in length; a ten-incher may be taken as a large one. They attain to maturity at a length of about eight inches. Sadly, they are unwise, being so far removed from man, and they take the fly with a dash and at the first cast that leads many a fish hog to catch ten times more than he should. Quieter stretches of water (as where it flows through the meadows) provide good fishing. The trout angler will find joy in taking a very few of these exceptional fishes and enjoy the thought that he is in a region that, for beauty, it is hard to equal.

Unknown to many, the size of the stream, the river or the lake that a rainbow trout is found in has its effect upon the size of the fish. The reason of this is two-fold: first, the size of the stream; second, the smaller amount of food that it produces. It is for this reason that the rainbow trout often mature when they are six inches in length, in the streams of the high altitudes. They will ravenously seize the artificial fly, believing it food, for there is a scarcity of it, and therefore its attractiveness is instantaneous. In the slightly larger streams the rainbow trout attain to weights of about two or three pounds. In still deeper streams and large pools four-pounders are not uncommon. The Kern, the Kings and the Merced rivers are representative rainbow

*It was later learned that the specimens to which Dr. Jordan gave the name *Salmo agua-bonita* really came from Cottonwood Creek, into which they had been introduced from South Fork of Kern River, and that the trout of Volcano Creek is a very different species, which Dr. Evermann named *Salmo roosevelti*. See pages 124-125.

streams. In the lakes (as in Kern Lake) the rainbow trout reaches to a weight of eight pounds. In the Klamath Lakes rainbow trout have been taken as high as twenty-five pounds in weight. The ocean-running rainbows are large; they are salmon-like fellows. They feed heavily in the ocean and thus attain often gigantic weights. In the ocean their beautiful fresh-water coloration fades and they become silvery in coloration. They generally come up to the coast rivers in the month of March to spawn.

Summer on the California trout streams is one of joy unending and success in due measure. Nevertheless, it is strange what a falling off occurs in the number of anglers who visit the streams in the latter part of July and August. Opening days are always attended by outward moving delegations of anglers; and the streams are thickly peopled. Later on, however, they dwindle down to twos and threes—and the streams are left to themselves. A certain number of these sons of Walton know that the best fishing occurs when the heats of summer lower on the earth, for it is then the mountain waters yield up their fairest specimens. These secluded pools are then veritable treasure-places and bear a careful looking into; it takes skill and the correct lure, but the wise angler is never wanting in fitting perfectly into the situation. Live bait, spinners and artificial flies are used. The live-bait man knows that the grasshopper is a telling lure what time the July sun is gilding the heavens and is never to be found near to the waters then without a box of them. How to use them on the hook without impaling them? Simply procure some of the smallest druggist rubber snaps. Take a sufficient number of turns of the rubber around the hook, bend and then insert the hopper in the loop. Helgramite are attached to the hook in the same manner and they will still be as alive as ever. The druggist rubber snap is a bait-saver, and no mistake. One may catch fifty trout (if it so be) on a helgramite, attached to the hook with a snap, and at the end of the day's fishing it will be as active as ever. The larvæ of the Dobson fly (which is the helgramite) are only too well known to the live-bait fisher. They are those wicked-looking creatures one finds in the streams upon turning up stones. They have a series of pincers on each side, though they are more savage in appearance than in actual combat. It has been said that when all else in the line of bait fails, the helgramite, the grasshopper and the angleworm will win.

And there is method in the skillful use of the angleworm, too. In fact there is an art, in itself, to "working for trout," as it is called. Your chuck-and-chance-it, live-bait fisherman will hook on a great gob of worms; will start it at the head of a pool and will let it tumble, haphazard down with the current, rolling over the bottom of the stream. Some rainbows may see it and take it, no doubt, but not the fish you are looking for. The true sportsmanlike method of worming for trout consists in connecting a bare hook to a spinner—a No. 1 or 2 spinner will do nicely. To this bare hook the worm is attached so that it will trail in the water. Instead of driving the hook throughout the worm, it is hooked just under its skin. It requires some little art to cast this—in fact, it is not a cast at all, but is allowed to play out in the water. The spinner will whirl, throwing off a silvery ray, and the long, trailing worm will have a snaky, wavering motion in the water

that proves instantly attractive. Move this into some suspicious-looking mountain pool and if there is a large rainbow trout there he will be interested in sampling your offering, be it feeding time or no. It is hard, in the finny world, to refuse an angleworm that trails so subtly and enticingly in the water.

However, the safest and most certain method in using the angleworm for a lure goes as follows, and has never been known to fail at getting the fish that strikes: A No. 10 is slipped on to a leader and is tied to the leader one and one-half inches from the end of it. The hook should not stand out from the leader; rather the hook shank should be along the leader. This done, a second hook is tied on to the leader at the end, to be the lead hook, the front hook, so to speak. Now the worm is connected to this affair, the head of the worm being attached to the back hook, while the front hook is worked into the body. To all appearances when this is moved in the water the worm is free; this is especially true if you are using an invisible leader, of which there is at least one on the market. When a fish strikes this worm he will hook up either to the first or the second hook on the leader, or both. There is hardly a chance here of nipping off the end of the worm for the simple reason that there is a hook in it.

It seems strange, but nevertheless a fact: Trout will strike freely and well, it seems, at all times, on the fore-fin of a trout. Simply upon capturing a trout sever one of the fore-fins and attach it to the hook. Some of the largest rainbow trout in the mountains will take the fin viciously when even the succulent grasshopper fails. This fact may be known to some anglers, but it is as one in ten. The same is true of a little white strip cut from the belly of one of your trout, about two inches long and one-half inch wide at the butt end. Attach this to the hook at its tip and play it to the current. If the current is strong, one will need to place several split-shots on the leader to sink it. Then let out line. Let it flow downstream. Seventy-five, one hundred, one hundred and fifty feet, perhaps. Down it goes, moving in and out of the pools. Suddenly a large fellow beside a boulder will seize it and the fun begins. These methods win when the fish are weak on surface feeding, and are closer to the bottom; and this often happens. Do not forget the fore-fin or the belly-fin of the trout as a lure. Many are not aware of it, but the artificial fly known as the Parmachenee Belle, was made in imitation of the belly-fin of a trout. Think of it; instead of imitating an insect (as many suppose it should) it is an imitation of the belly-fin of a trout. Could anything be more incongruous? Yet it was such a valuable hint that the inventor (a great angler) made a fly to represent it. The July and August angler in the mountain pools should give this his careful attention.

It has been said that there are times in July and August when the angler is not able to "rise" a fish; that the fish do not even seem to do any surface-feeding. Naturally, the best fishing goes on when the fish are rising to the top for insects, as when a hatch of insects is on and they are rising from the bottom of the stream. The higher one goes up in the mountains the fewer, it appears, become the true stream insects. The angler must needs use art in collaboration with some true study to make some appreciable catches. Mountain trout may be uncertain fellows. Having had poor luck (if any) with a small fly, he may

shift to a rather large fly (even a bass fly) and immediately rise a large fellow and make the best catch of the season. The trouble with the ill luck of many anglers is that they give no time to experimentation. They place their luck with one variety or color of fly, or one size of fly, and remain at that, without trying anything else. There is another extreme to this in that many fly-fishermen are constantly changing flies and using one but five minutes before another shift is made. The result is that no fly is given a true tryout. Again there is a hint learned from experience: One cast well-judged and well-placed is worth ten indifferent casts that have been poorly placed. The difference is that the well-placed cast is the one that brings success; the poor casts, ill-judged, are so much waste of time. Study every nook and cranny of the stream you are to cast over. Don't make a cast till you have mentally made note of where a large fellow would in all likelihood happen to be. For instance, beside that large boulder there is a patch of still water. If you can make a cast so that your fly, or flies, will fall on the boulder you will craftily pull them off the boulder—and in the most natural manner they will fall to the still patch of water. Deceived, believing the artificial flies true insects, that large and dazzling rainbow will rise and take the offering. Or here is a semidark place under a sedgy bank. There is a still place there. A trout should be lurking in that nook. Or here is a log in the water. Try your bait or fly alongside of that, seeing to, always, that your fly falls first, not the line and leader first. Poor casting, I firmly believe, has only **one result, that being: Ill luck!**

During the fore part of the season a great number of anglers go out, but they are live-bait users almost entirely. The salmon-egg contingent, the dyed-in-the-wool fly-fisherman calls them—and the true fly-fisherman can be counted on to eschew the streams till the inimitable July and August days arrive. Then he goes happily forth into the mountain stillnesses.

There is a reason, too. The early fisherman had to contend with high and swift water which was mostly discolored. It was the using of live bait entirely, for the stream insects were not hatching, so that the trout could be deceived by artificial counterparts. Now, however, the winged life is abroad; the fly-fisherman is in his element. As the warmer days come on, the water in the lower reaches of the rivers disappears or becomes heated out, the fish gradually but surely make for the upper pools, and thence follow the fly fishermen. It is riotous travel at times; the road is rough. Sometimes there are no roads and one makes his own paths at will. But there is a reward among the cools of the upper valleys and natural parks where Nature in all her untrimmed and majestic glory contrives to make California the true Arcadia of the disciple of Walton.

PARASITES WHICH AFFECT THE FOOD VALUE OF RABBITS.

By E. RALPH DE ONG, University of California.

A fringe of small, lead colored bodies, the size of coarse shot, is frequently seen on the ears of the brush or cottontail rabbits. These are young ticks, the immature form of one of our common species, probably the wood tick (*Dermacentor occidentalis*). After hatching from the egg the young ticks wait in the grass for a passing rabbit or other animal, attach themselves and feed for three or four days, drop to the ground and molt (shed their old skins), then await another chance to feed.

The presence of these ticks has no effect on the rabbit except a slight loss of blood and a temporary annoyance, and as this tick has not been

Fig. 18. A young blacktailed jackrabbit, an animal often discarded for food because of the presence of parasites. Photograph by J. Dixon. No. 199, Calif. Mus. Vert. Zool.

reported in California as a carrier of any disease it need not be considered as of any significance.

The species of fleas commonly found on rabbits in this state have not been reported as disease carriers so that the presence of these insects can also be disregarded.

One species of botfly (*Cuterebra* sp.) attacks rabbits very commonly. The larvae of this fly is almost black in the mature stage, about three-fourths of an inch long and covered with tiny spines. Brush rabbits taken in Sonoma County up to the last of July were commonly infested with this insect. After the first of August no larvae were found, they apparently coming to maturity at this time. They then leave the host and bury themselves in the ground, emerging the following year as flies. The larvae are found just beneath the skin along the back or breast.

The only outward indication of their presence is a slight enlargement at the affected point. No injury to the muscles was noted in any infested specimen, the body being apparently in a normal condition. Wounds of this kind may, however, become infected by bacteria or become infested with some of the flesh feeding flies and in this way produce large tumorous swellings. These latter attacks, when severe, may produce an emaciated condition of the animal which manifestly impairs the value of the carcass for food. But if the larvae are present on the body of the rabbit, without any outward or internal sign of disease there would seem no reason for discarding the same.

Rabbits are occasionally taken in this state which show the larval form of a common tapeworm (*Cœnurus serialis*) which, when eaten by the dog produces the adult tapeworm *Tænia serialis*.[1] The infestation in the rabbit appears as a transparent, bladder-like swelling which may be as large as a hen's egg or larger and is of frequent occurrance in jackrabbits, often spoken of by hunters as "boils." Scattered about on the inner surface of this bladder will be seen white dots about half the size of a pinhead. These are the undeveloped heads of tapeworms, each one of which is capable of developing into a mature tapeworm if taken into the body of a carnivorous animal in a living condition. Hence an animal eating an uncooked rabbit infested with one of these bladder worms will develop a typical case of tapeworm. Thorough cooking will kill the larval form so that the meat can be fed to animals without danger. But the uncooked carcass or viscera should not be fed to animals.

One specimen of brush rabbit had two infestations; one originating in the thigh had grown so large as to displace the muscles, the second formed a large swelling on the surface of the breast. Any infestation of this kind should be regarded with suspicion and the carcass burned or buried deeply so as to be out of reach of all carnivorous animals.

Domestic rabbits and probably the wild form are subject to a disease called *coccidiosis* resulting from the attack of a sporozoa (*Coccidium oviformæ*). The symptoms are snuffles, running at the nose and diarrhœa. The inner walls of the intestines show reddened patches with more or less ulceration. The liver is enlarged and the interior has many small round abscesses filled with pus; as the disease progresses the carcass becomes emaciated. Animals affected with this disease should **be considered as unfit for food.**

An ear mite (*Otodectes cynotis*) is mentioned by Professor Herms as sometimes being abundant enough to cause serious disease or death to **domestic rabbits.**

[1] Determination by Professor W. B. Herms.

OUT FISHIN'.

By Edward A. Guest.

A feller isn't thinkin' mean—out fishin';
His thoughts are mostly good and clean—out fishin';
He doesn't knock his fellow men,
Or harbor any grudges then;
A feller's at his finest when—out fishin'.

The rich are comrades to the poor—out fishin';
All brothers of a common lure—out fishin';
The urchin with the pin and string
Can chum with millionaire an' king;
Vain pride is a forgotten thing—out fishin'.

A feller gets a chance to dream—out fishin';
He learns the beauties of a stream—out fishin';
An' he can wash his soul in air
That ain't foul with selfish care,
And relish plain an' simple fare—out fishin'.

A feller has no time for hate—out fishin';
He ain't eager to be great—out fishin';
He ain't thinkin' thoughts of self,
Or goods stacked high upon a shelf,
But he's always just himself—out fishin'.

A feller's glad to be a friend—out fishin';
A helping hand he'll always lend—out fishin';
The brotherhood of rod an' line,
An' sky an' stream is always fine;
Men come real close to God's design—out fishin'

A feller isn't plottin' schemes—out fishin';
He's only busy with his dreams—out fishin';
His livery's a coat of tan;
His creed's to do the best he can;
A feller's always mostly man—out fishin'.

CALIFORNIA FISH AND GAME

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All material for publication should be sent to H. C. Bryant, Museum of Vertebrate Zoology, Berkeley, Cal.

July 15, 1919.

"There is nothing that attracts human nature more powerfully than the sport of tempting the unknown with a fishing line."—Henry Van Dyke.

VINDICATION.

Periodically, the state Fish and Game Commission is attacked by members of the legislature. Any state commission which has to do with the enforcement of law is subject to such attacks. In 1911 an investigation was ordered by the assembly. The investigating committee, however, gave a very favorable report as to the activities of the Commission. The 1919 assembly began an inquiry which also resulted in complete vindication for the Commission. We hope to publish in the next number the full report of the Committee on Governmental Efficiency and Economy to which a resolution by Assemblyman Elden was referred. While it would seem that the resolution was actuated by spite, the result has been very favorable to the Fish and Game Commission, for it has shown the people exactly where the Commission stands and has widely advertised the accomplishments of the past few years.

NATURE STUDY LIBRARIES TO BE FURNISHED SUMMER RESORTS.

Compact nature study libraries will be placed at those Tahoe resorts which are selected for the educational work of the Fish and Game Commission the coming summer. The libraries will include books on birds, mammals, wild flowers, trees and kindred subjects. Donated to the state by the California Nature Study League, they will be deposited with the Fish and Game Commission to be thus utilized in the commission's educational work. These libraries will be annually loaned to summer resorts in the future and probably represent only the beginning of a work which will eventually cover all the summer resorts of California. They are intended for use at that time when people, being on a vacation, are most receptive to studying intimately the miracles of nature. In ways such as this the Commission is applying the motto: "Conservation through education."

THE 1918 CATCH OF FISH.

Among the reports of this issue of CALIFORNIA FISH AND GAME is a complete statement of the fresh fish taken in California during the year 1918. In this statement there is included a record of fish taken in Mexican waters and brought into California through San Diego and San Pedro, but this is not included in the total for California.

The total catch of all varieties of fish in California for 1918 was 250,218,041 pounds. Compared with the 201,575,953 taken in 1917, this shows an increase of 48,642,088 pounds, or a trifle over 24 per cent. For a ready comparison of catches of the more important fish for 1917 and 1918, the following table is given:

	1917	1918
Albacore	30,556,243	7,263,895
Barracuda	2,965,368	3,885,691
Bonito	889,896	2,264,164
Halibut	3,585,666	2,837,987
Herring	7,435,997	7,938,280
Mackerel	3,345,563	4,005,906
Rock fish	6,255,380	6,281,425
Sole	8,728,429	7,027,767
Salmon	11,007,442	13,026,076
Sand dabs	2,631,862	1,751,609
Striped bass	1,466,856	1,497,441
Shad (buck and roe)	5,641,320	2,883,645
Sardine	104,103,231	157,652,811
Skipjack	———	3,023,847
Tuna	———	6,240,971
Yellowtail	2,887,413	11,658,350

The figure for the albacore catch of 1917 includes the bluefin and yellowfin tuna taken. In 1918 the albacore catch was very short and as bluefin and yellowfin tuna were more plentiful, a much larger number were taken and were for the first time separated from the albacore under the name "tuna." The tuna and albacore catch combined in 1918 was less than half the albacore catch of the previous year.

The sardine catch shows a phenomenal increase although southern California had a light run of sardines during the latter

Fig. 49. Four new fish hatcheries. Upper left, Ft. Seward Hatchery, Ft. Seward, California; upper right, Kaweah Experimental Hatchery, Kaweah River, Fresno County, Cal.; lower left, Clear Creek Hatchery, Westwood, Lassen County, Cal.; lower right, Domingo Springs Hatchery, Domingo Springs, Plumas County, Cal.

part of 1918. Shad, halibut, sole and sand dab all show a decreased catch during 1918, while bonito, barracuda, mackerel, salmon, striped bass, skipjack and yellowtail all show an increased catch. Although the catch of salmon on Monterey Bay was less, much heavier catches were made at Drakes Bay Fort Bragg and on the lower Sacramento River, which brought the total catch for 1918 to over two million pounds more than that of the year 1917. There was no great fluctuation in the catch of other species.

There was a decrease of 41,177 dozen in the catch of crabs and of 41,943 pounds in the catch of crawfish, while the catch of shrimps shows an increase of 117,174 pounds ove the year 1917. The mollusks do not show any great changes over previous years.

The Department of Commercial Fisheries is making every effort to secure and complete accurate statistics of the catches of all fish and it can readily be seen that a comparison of yearly catches for a number of years will aid in determining whether any certain species is being overfished and depleted, or whether it is becoming more abundant.—N. B. S.

MAINTAIN A SUPPLY!

It can not be expected that wild life resources, if left to themselves, will continue to yield food and sport indefinitely. The reason, of course, is to be found in the encroachment of civilized man, which not only means increased destruction, but a diminution of food supply and nesting sites. Under the artificial conditions now fostered a constant supply can be maintained only through carefully planned protection and propagation. By looking over the attainments of the Commission whose function is to perpetuate fish and game, we are assured that the financial outlay has been more than justified.

RAINBOW TROUT ACCLIMATIZED IN ARGENTINA.

In 1903 at the request of the government of Argentina the United States Bureau of Fisheries donated the eggs of

several varieties of fish to the southern republic. A letter recently received by the Bureau states that thousands of Eastern brook trout are now being caught annually, that some mea e 19 inches, and have a weight of 10 pounds. In the mountain range of Aconquija in 27° south latitude and in the Patagonian region as far south as 52° latitude, the rainbow trout is doing well.

A COLLEGE OF FISHERIES ESTABLISHED.

An event of great importance to those interested in the fisheries of the United States, and especially so to those of the Pacific coast, has been the recent establishment of a College of Fisheries in connection with the University of Washington at Seattle. The need for such a college has been felt for some time, and Dr. Suzzallo, the able and progressive head of the university, is to be congratulated upon his action in this matter.

The commercial fisheries of the Pacific coast are of great importance to its welfare, how much so being plainly indicated when it is stated that Washington, Alaska, Oregon, California and Hawaii produced last year approximately 1,000,000,000 pounds of raw fishery products valued to the fishermen at about $25,000,000. Seven-eighths of the world's pack of canned salmon is made on the coast, while tuna, sardines, clams, crabs, shrimp, mackerel, abalone, etc., are canned in large quantities and shipped to all quarters of the globe. Immense quantities of frozen, fresh, pickled, salted and smoked fishery products are also prepared and shipped. When so prepared the value of the fishery products of this coast alone is increased to over $100,000,000; the investment in plants, vessels, boats, fishing gear, etc., on this coast amounts to about $95,000,000, while over 75,000 persons are employed in fishing and preparing the above products for market.

The production of raw fishery products elsewhere in the United States amounts annually to approximately 2,250,000,000 pounds, valued, to the fishermen, at approximately $60,000,000. When prepared for market these products would probably be worth approximately $120,000,000.

The College of Fisheries just established by the university enjoys the distinction of being the only one of any consequence in the world outside of Japan. In the latter country the Imperial Fisheries Institute at Tokio is a government institution and has been in existence since 1897. Since then subsidiary schools have been established in various provinces of Japan.

Seattle is an ideal location for such a college, as within its corporate limits, or in territory immediately adjacent, are to be found in active operation practically every style of plant used in turning the raw fishery products into all forms of manufactured articles both for food and for use in the arts and sciences; while the great salmon, halibut, cod, and herring fleets operating in Alaska waters have their headquarters mainly in this city, outfitting here and bringing back the products for shipment to the four corners of the world.

The college offers four year courses in fisheries technology and fish culture. The fisheries technology courses will train men

TROUT FRY DISTRIBUTED IN STREAMS AND LAKES OF CALIFORNIA DURING PAST THREE YEARS.

	1916	1917	1918	Total
Rainbow	3,399,920	5,223,500	5,680,500	14,303,920
Eastern brook	2,068,500	1,617,500	2,294,500	5,980,500
Loch Leven	1,620,000	1,468,000	1,633,000	4,721,000
Black spotted	3,835,270	3,836,000	1,059,500	8,730,770
Steelhead	5,213,170	6,699,420	4,483,000	16,395,590
German brown	77,300	.....	.....	77,300
Golden trout	.....	.....	384,000	384,000
Totals	16,214,160	18,844,420	15,534,500	50,593,080

for various lines of work in industrial plants. Owing to the nature of the business, as noted above, there is always a demand for trained men in the salmon and other canneries cold storage plants, smokehouses, and fertilizer and oil plants. Every effort will be made to make the courses as practical as possible, and students will make visits to the plants whenever possible so they may obtain first-hand information as to the methods in vogue. They will also receive training in bacteriology and chemistry, and thus will be fitted for work in marine biological laboratories, and in chemical and bacteriological laboratories, specializing in fishery products.

The practice of fish culture is becoming a very important one, and the demand for trained men is bound to increase. Students at the college will not only have the benefit of its instruction and equipment, but can also obtain an abundance of practical experience along all lines of fish culture at the many federal and state hatcheries scattered throughout the state of Washington.

Pond culture, or the farming of our inland waters, will some day be an important industry, as there are many thousands of small lakes, ponds, streams, and marshy spots which would be utilized in this work, and acre for acre produce greater returns than a similar area of land devoted to agriculture.

The shellfish industry of the Pacific coast has not thrived for some years, due largely to faulty methods, and it is hoped that with more modern methods taught there may be a revival of this industry, which ought today to be one of the most important on the coast.

It is hoped in the near future to offer short courses in practical fishery subjects during the winter months when fishing operations are quite generally suspended, these courses to be open to those now engaged in the fisheries and others who desire knowledge along special lines and do not have the time nor desire to take the full courses.

As the university is a state institution, an especially important part of the work of the College of Fisheries will be in rendering assistance and advice whenever called upon by the state authorities, and also to aid the commercial fishermen not only of the state but of the nation in solving the many problems which beset them, and to aid in the conservation and perpetuation of our wonderful fishery resources. Research work along the lines of utilization of hitherto neglected species, and of waste products, will be carried on and it is hoped will result in materially increasing the wealth of the state and nation.

It had originally been planned to open the college at the beginning of the fall term in October, but so many of our returning soldiers expressed a desire to take up the work at once that hurried preparations were made and the college opened for the spring quarter beginning March 31, last.—JOHN N. COBB.

MANY LIONS KILLED.

Bounty reports for the first three months in 1919 show that an unusually large number of mountain lions have been killed in the state. The exact reason for this kill is not apparent, but doubtless the hiring of a man to give all of his time to the destruction of predatory mammals has had some effect in stimulating the destruction of the famous deer killer. The totals for the three months are as follows:

January.

21 males at $20.00		$420 00
24 females at $30.00		720 00
		$1140 00

February.

10 males at $20.00		$200 00
16 females at $30.00		480 00
		$680 00

March.

22 males at $20.00		$440 00
18 females at $30.00		540 00
		$980 00

AIRPLANES TO LOCATE FISH.

Still another use for the airplane is to be found in the recent experiments carried on along the Atlantic coast where a duly qualified observer has been making flights to locate schools of fish. Information so obtained is telegraphed to the fishing interests.

FISHERY PRODUCTS LABORATORY ESTABLISHED.

The increased importance of the California fisheries has led the United States Bureau of Fisheries to establish an experimental laboratory at San Pedro. The laboratory is now completed and the equipment installed. A corps of three scientists will experiment on methods of preserving fish and otherwise render service to those engaged in canning, drying or salting fish.

THE OWNERSHIP OF WILD LIFE.

Wild life is the property of all the people. No one attempts to deny this, and least of all the game violator. From his point of view it is not only the property of all the people, but it is more particularly the property of him who can get it. The more remote the locality where the law is violated, the more deeply rooted is the idea that the game is there to be taken, regardless of law, and without much feeling of moral obliquity. The violator has a strange feeling that some sort of justification is on his side, though the law may be on the other. The point of view is that of early colonial times, before the state had reason to assert its ownership—when, indeed, game was the property of anyone who could shoot straight enough. It is the point of view of an extreme individualist.

Game is still the property of everyone. But whereas originally the people placed no restrictions upon the use of that property, they have now thrown about it safeguards that are vital for its continued existence. Every citizen has a vested interest in every individual bird, animal and fish, and is defrauded if the game is taken in any way contrary to the established rules. The point of view of the man who respects the law, and insists upon respect for it in others, is that of collective ownership. His individual right to take game is dependent upon consent to do so from others.

The feeling of collective ownership is still only partly developed. The tendency to wink at violations still decreases as the sense of common ownership of wild life is strengthened.—*The Conservationist*, Nov. 1918, p. 173.

OUR FUR RESOURCES.

More and more we are discovering that the annual take of furs in California is considerable and that the money received by the trappers amounts to a large sum. Most of the furs are shipped to Eastern markets, but recently it has come to our notice that many furs are utilized by the trappers themselves. The books of the Eberhard Tanning Company of Santa Clara showed that during 1918 the following skins were tanned by them: 11 bear, 7 lion, 488 deer, 128 coyote, 86 raccoon, 12 badger, 176 fox, 15 opossum, 95 skunk, 121 wildcat, 429 rabbit, 53 tree squirrel, 14 mole.

A canvass of the different tanneries would doubtless furnish some valuable evidence as to what proportion of furs are used for home consumption.—I. L. Koppel.

BLACK BASS IS NOT A TRUE BASS.

Some of our readers have perhaps wondered why they did not find some mention of the black bass in the article entitled "Bass and Bass-like Fishes" which appeared in the April number. The primary reason is that the black bass is an introduced fish in our state and furthermore, this fish is more closely related to the sunfishes than to the true basses.

FACTS OF CURRENT INTEREST.

J. C. Bruce, the state lion hunter, has been at work in and around the McCloud River Game Refuge, District 1E. In this locality he secured three lions. This makes a total of 15 since January 1, together with 6 wildcats. Mr. Bruce started operations in Monterey County during May.

The past year brought splendid returns to the fur trapper. In several instances trappers received as high as $20 for coyotes, $8 for wildcats, and $2.50 for muskrats.

The Fish and Game Commission will install a permanent exhibit in the new building at the State Fair Grounds in Sacramento. The whole north alcove will be used to display the fish and game of the state and the activities initiated to conserve it.

Motion pictures showing the commercial fisheries of the state are being secured for use in educational and publicity work.

Far more definite research work on fish and game is now being carried on by the Commission than has been undertaken heretofore. Professor J. O. Snyder of Leland Stanford Junior University has been secured to undertake a scientific investigation of the quinnat salmon.

A study of the furbearers and the furbearing resources of the state is being undertaken by the Commission.

One haul of a trawl net made recently off the coast of southern California netted a ton of fish of seven different varieties.

Sportsmen convinced that the deer season has opened too early in southern California succeeded in having the law changed by the Legislature to provide for a September 15 opening, 15 days later than formerly.

Applications have been received requesting the setting aside of three different areas as state game reservations. An area of 25,000 acres, one of 30,000 and one of 20,000, are situated in Santa Barbara and Ventura counties.

Progress is being made on the attempt to negotiate treaties with the Spanish-American republics for the protection of migratory birds. The matter has been referred to the Department of Agriculture that appropriate conventions may be drafted. The state department has promised to act as soon as these drafts are received.

Paladini, the wholesale fisherman of San Francisco, was recently arrested for trawling within the three mile limit. He deposited $250 cash bail for his appearance before Judge De La Montanya at San Rafael. As Mr. Paladini did not appear, his bail was declared forfeited and a bench warrant was issued and given to Constable Crane to serve.

HATCHERY NOTES.

W. H. Shebley, Editor.

BROOKDALE HATCHERY.

The take of eggs at the Scott Creek station will amount to approximately 1,700,000, of which 1,000,000 will be hatched at the Brookdale Hatchery for distribution in the streams in that section of the state. Shipments of eggs have been made to Wawona, Mt. Shasta and Mt. Whitney hatcheries, from which stations they will be given general distribution in suitable streams.

SNOW MOUNTAIN STATION.

The take of eggs at Snow Mountain Station, on the Eel River, was much greater than that at Brookdale, and will amount to probably 4,500,000. Of the eggs hatched at Snow Mountain 200,000 are to be planted in the upper reaches of the Eel River near the station, and the balance of the eggs have been shipped to Ukiah, Yosemite, Fort Seward, Mt. Whitney, Domingo Springs, Mt. Shasta, Kaweah and San Mateo hatcheries. From these stations the resulting steelhead trout fry will be given an extensive distribution under the arrangements made for carrying on this season's operations.

MT. TALLAC HATCHERY.

The Mt. Tallac Hatchery was opened for operations during the latter part of March, and the work is progressing very nicely. To date there have been nearly 2,000,000 black-spotted trout eggs taken and we expect to reach the 3,000,000 mark before the end of the season.

FALL CREEK HATCHERY.

The rainbow egg-collecting stations on the Klamath River were opened for operations during the month of February. Racks and traps were installed in Cottonwood Creek, near Hornbrook, and in Camp, Bogus and Fall creeks; and 1,750,000 rainbow trout eggs were taken at the four stations. A portion of the eggs were immediately shipped to Mt. Shasta Hatchery to be eyed, and the balance were placed in troughs at the new Fall Creek Hatchery, where they will be eyed for shipment to stations in other parts of the state. We have also arranged to hatch nearly a half million rainbow eggs at the Fall Creek Hatchery for distribution in the Klamath River this season. A million quinnat salmon eggs

Fig. 50. Fall Creek Hatchery. A fine modern hatchery built by the California-Oregon Power Company in lieu of a fishway over the Copco Dam. Photograph by L. J. Stinnett.

have also been hatched at the Fall Creek Hatchery and the resulting fry will be distributed in the Klamath River. Shipments of rainbow eggs will be made from Fall Creek Hatchery to Ft. Seward, Mt. Shasta and Yosemite hatcheries, from which stations they will be given the usual distribution.

BEAR LAKE HATCHERY.

Fish cultural operations were commenced at the North Creek egg collecting station during the latter part of March and racks were put in both North Creek and Metcalf Creek. The season has been a very favorable one, and while the run is still on, we believe that the take of rainbow trout eggs at this station will amount to approximately 4,500,000. Arrangements are being made to hatch and distribute 750,000 rainbow fry from the North Creek Hatchery, and a like number will be sent to the Bear Lake Hatchery, located at Green Spot Springs, from which station they will be distributed in Big Bear Lake and streams of San Bernardino County later in the season. Arrangements are being made to ship eyed eggs from the North Creek station to Mt. Whitney, Mt. Shasta, Yosemite, Kaweah and Wawona hatcheries.

ALMANOR HATCHERY.

Almanor Hatchery was opened for operations during the early part of March, and during the fore part of the season there was a good run of rainbow trout. However, it became necessary for the Great Western Power Company to run a big head of water through the Almanor spillway on account of the rapidly melting snow, and this prevented the biggest part of the run of rainbow trout from reaching our racks. However, we will probably receive between 300,000 and 400,000 eggs as the result of the season's work.

DOMINGO SPRINGS HATCHERY.

Domingo Springs Hatchery was opened the latter part of March and at the present time the run of rainbow trout in Rice Creek is on. Very few eggs have been taken to date, but the season promises to be a very favorable one.

CLEAR CREEK HATCHERY.

Clear Creek Hatchery will be opened up during the latter part of May and rainbow trout eggs will be shipped to this station from Almanor and Domingo Springs hatcheries. The resulting fry will be distributed in streams in the vicinity of Westwood and other portions of Lassen and Plumas counties.

MT. SHASTA HATCHERY.

The take of Loch Leven and German brown trout eggs was very successful. More Loch Leven trout fry will be distributed from Mt. Shasta Hatchery during the coming season than ever before. The German brown trout eggs taken are from stock held in the ponds at Sisson Hatchery resulting from eggs received from the Minnesota Fish and Game Commission three years ago. These will be the first German brown trout fry distributed in California for a number of years. The take of Eastern brook eggs was less than usual, and we will have only approximately 1,000,000 fry of this species for distribution during the coming season. Rainbow trout eggs from the Klamath River stations, Domingo Springs and North Creek, and steelhead eggs from Brookdale and Snow Mountain stations have been shipped to the Mt. Shasta Hatchery and the same will be hatched and reared for distribution in streams.

MT. WHITNEY HATCHERY.

Rainbow, Loch Leven, Eastern brook, black-spotted and steelhead eggs have been shipped to Mt. Whitney Hatchery from different stations in the state, and the resulting fry will be given wide distribution in the streams of southern California during the coming season. During the coming month we expect to open up Cottonwood Lake station, and if results are as satisfactory as during the past season we should obtain a half million or more golden trout eggs. These would be immediately transported to Mt. Whitney Hatchery and hatched for distribution in streams and lakes of the state.

WAWONA HATCHERY.

Wawona Hatchery was opened shortly after the first of May and rainbow and steelhead eggs are being forwarded from other stations. The resulting fry will be given the usual distribution in that section.

Fig. 51. Bear Lake Hatchery, San Bernardino County, California. The output of this hatchery stocks most of the streams of southern California. Photograph by Burns.

EXPERIMENTAL HATCHERIES.

A hatchery has been established in the Yosemite Valley at a site selected for the erection of a permanent hatchery, if the results of this season's operations are satisfactory. Before erecting a permanent hatchery in this section we deemed it advisable to determine by practical experiments if conditions were favorable for fish cultural operations. Rainbow, steelhead and black-spotted trout eggs will be shipped to the station and if the experiments are successful the resulting fry will be distributed in streams and lakes of the Yosemite Valley.

An experimental hatchery to determine the suitability of the waters of the Kaweah River for hatchery purposes has been established on the Kaweah River, near the town of Hammond, Tulare County. Rainbow, steelhead and black-spotted eggs have been shipped to this station, and if the resulting fry survive they will be distributed in the waters tributary to the Kaweah River, Tulare County.

NEW EXPERIMENT ON HATCHING SALMON ARTIFICIALLY.

The California Fish and Game Commission is trying out a series of experiments with trout eggs, to determine whether or not salmon can economically and scientifically be hatched and reared in cages placed in the beds of streams. These experiments will be conducted with eggs artificially fertilized and placed in the beds at different stages of development. Later in the season when salmon eggs are available the experiment will be continued by substituting the salmon for trout eggs. The idea is not a new one, as it was suggested by Professor Cloudsley Rutter in 1899. An experiment was made by Professor Rutter at that time, but on account of an accident the result was not conclusive. The Commission will now carry on experiments to determine whether any improvement in the propagation of salmon can be made along these lines. The experiments will be under the supervision of the fish experts of the Department of Fish Culture.

COMMERCIAL FISHERY NOTES.

N. B. Scofield, Editor.

FRESH FISH USED BY REDUCTION PLANTS AT SAN PEDRO.

During the last four months millions of pounds of fresh fish have been used in the manufacture of fish meal and fertilizer. The run of fish increased to such an extent in the first part of May that the reduction plants could not handle all the fish brought in. The fishermen, however, continued to bring in large catches of sardines regardless of any idea that they could be disposed of or handled by the reduction plants.

On April 30, the Minnie F brought in 58,995 pounds of barracuda, all of which could not even be used by the reduction plants.

The total amount of fish used to manufacture fish meal and fertilizer during the months of January, February, March and April, 1919, was as follows:

	Pounds
Sardines	15,630,067
Barracuda	58,995
Rock cod	15,254
Kingfish	9,290
Halibut	4,000
Shark	2,712
Total	15,718,006

Fig. 52. Boatloads of sardines at San Pedro, May 6, 1919. All of this fish went to the reduction works to be made into fertilizer.

went to a reduction plant. On May 6 many sardine boats arrived loaded to full capacity with sardines which later went to reduction plants to be made into fish meal. One of these boats had 26 tons of sardines on board.

All the reduction plants combined have a capacity of about 1200 tons daily. The surplus was so great the city health department ordered 185 tons of sardines dumped out at sea in one day. The sardines were in such a bad condition they

Up to June 1, over 32,000,000 pounds of sardines had been utilized by the reduction works.—Earl M. Nielsen.

BETTER RECORDS OF CATCH NECESSARY.

In this issue of California Fish and Game will be found a statement of the canned, cured and manufactured fishery products of California for the year 1918. Although most of the packers have gladly furnished the Commission with the infor-

mation requested, considerable difficulty has been experienced in securing the record of packs made by a few firms throughout the state. Because of the lack of co-operation on the part of these few firms there are, no doubt, a number of discrepancies in the figures, not so much in the quantity as in the size and kind of container. Much of the salt fish is shown in barrels, although much of it may have been packed in smaller containers. The tuna pack reported by some firms includes their albacore pack, therefore the tuna pack shown is really more than the actual pack, while the albacore pack is short.

It will be the aim of the Commission to have the necessary blanks for the 1919 pack in the hands of all packers before the end of the year and it is hoped that all packers will co-operate with the Department of Commercial Fisheries of the Fish and Game Commission by filing a complete and accurate report of their operations for 1919 at the close of the year. This will enable the Commission to issue intelligent information on the California industry which should be of great value to all concerned. No information is given out regarding the pack of any individual firm and any statement or report made up and published, or furnished for publication, will be for the sole purpose of furthering and boosting a great California industry.

Fig. 53. Food fish made into fertilizer. Left, 26 tons of sardines; right 58,000 lbs. of barracuda.

FIRST TUNA RECEIVED MAY 14.

The first yellow-finned tuna to reach any of the San Pedro and Long Beach canneries was received by the Van Camp Sea Food Company on May 14. The tender Undine brought approximately 13½ tons of yellow-finned tuna (*Thunnus macropterus*) from Lower California, where the above company is operating a cold storage barge and floating cannery in conjunction with its San Pedro plant.

NORTHERN BOATS JOIN FISHING FLEET.

Eleven purse seine boats have arrived at San Pedro harbor from Puget Sound points. These boats average from 60 to 65 feet in length and are equipped with heavy duty engines of from 45 to 85 horsepower. They were formerly engaged in salmon fishing, but plan to fish for tuna in southern California waters.

FISHERMEN RECEIVE 20 CENTS FOR FIRST TUNA.

The first tuna (*Thunnus thynnus*) to reach the local wholesale markets were brought in by the Peter Pan, a purse seine boat, on May 22. The total catch consisted of 3717 pounds and the fish averaged about 20 pounds each. The fishermen found an active market for their catch and received 20 cents per pound in the round.

FLOATING CANNERY BURNS.

The floating fish cannery, John G. North, which before its conversion was a sailing vessel, plying between Honolulu and San Francisco and other Pacific coast ports, was burned to the water's edge the morning of May 14 off Cape San Lucas on the coast of Lower California, according to word brought here by the fishing launch Rex. The John G. North was beached, all the crew reaching the shore safely. The loss was $50,000. The John G. North was operated by the Van Camp Sea Products Company, which has a plant at San Pedro.

NOTES FROM THE STATE FISHERIES LABORATORY.*

By Will F. Thompson and Elmer Higgins.

GOAT FISH TAKEN IN CALIFORNIA.

Several specimens of a rare and beautiful fish hitherto unknown in southern California waters were taken by the Albacore in March, 1919. They belong to the species *Upeneus dentatus*, of the family of surmullets. The fish are small, covered with large scales, and brilliantly marked with crimson and yellow bands. A pair of long fleshy barbels extending backward from the point of the chin makes the name of "goat fish" seem appropriate.

The species is recorded as "rare" on the coast of Mexico, and has been taken only at Cape San Lucas, La Paz and Tres Marias Islands at the far end of Lower California. The specimens taken by the Albacore are from Encinitas in 21 fathoms and from Long Beach in 5 fathoms.

This is another instance of a supposedly rare fish taken by new methods of fishing. The error in assuming that such rare fish are migrants from Mexican waters, where they are abundant, is apparent.—E. H.

SPINY LOBSTER LARVÆ.

An interesting addition to our knowledge of the life of the spiny lobster provided by the collections of the Albacore, is another series of larvæ in the phyllosome stage. These specimens are similar to the ones described and figured for the first time in the January number of California Fish and Game and although they were taken in February, six months later than the first series, they show about the same degree of development. About two dozen were taken in surface nets in the vicinity of Osborn bank, outer Santa Barbara passage.—E. H.

ATTEMPT TO REAR GRUNION.

Following the discovery of the remarkable spawning habits of the grunion or little smelt (*Leuresthes tenuis*), the story of which by Will F. Thompson has just been published as Fish Bulletin No. 3, an attempt was made in a small way to rear the young grunion through the larval stages to the adult condition. The young were hatched from eggs taken from the beach and were placed in jars of sea water. Running water was not used, but the water was changed daily and food was added daily from tow-net collections taken from the end of the Long Beach pier.

The larvæ lived thus at about room temperature with a maximum range of 10° F. for eleven days, when the last one died. The fish, of course, had not lost their larval character in this time, but interesting and valuable observations were made on their early development, and on their food and feeding habits. The experiment also yielded experience which will be valuable in the rearing of the young of other food fishes—an undertaking which may be carried out with adequate equipment in the new laboratory.—E. H.

*California State Fisheries Laboratory, Contribution No. 2.

LIFE HISTORY OF FLAT-FISH.

The investigation of the life histories of various flat fishes of southern California has been progressing satisfactorily. Fourteen species of flat fish, Pleuronectidæ and Soleidæ, have been taken to date by the bottom nets of the Albacore and notes on their distribution and movements recorded. Material for the study of the development of several species has also been taken and is awaiting careful study. Among this material is a complete series in the development of the sand dab from the youngest larva scarcely 5 mm. long to the spawning adult. Very young stages or partial series have also been taken of the big-mouthed flounder (*Hippoglossina stomata*), the sharp-ridged flounder or turbot (*Pleuronichthys verticalis*), the lemon sole (*Parophrys vetulus*), the long-finned flounder (*Aystreurys lolepis*), two species of sand dab (*Citharichthys stigmæus* and *C. xanthostigma*), the diamond flounder (*Hypsopsetta guttulata*), the tongue sole or San Diego sole (*Symphurus atricaudus*), and the California halibut (*Paralichthys californicus*).

The study of the California halibut has proceeded further than the rest and includes observations on the age and rate of growth, comparative sizes and numbers of the sexes, seasonal movements and migrations between banks, spawning period and egg-production, and early development.—E. H.

PORPOISE CAPTURED.

A unique experience in shooting big game was enjoyed by the naturalist aboard the Albacore when he killed a large porpoise, probably of the species *Lagenorhynchus obliquidens*, on April 19, 1919.

A school of about a dozen individuals was sighted about 35 miles west of Point Vicente cruising on a course diagonal to that of the launch but at such speed that the launch was soon overtaken. The porpoises paused, circled about the boat several times, leaping and playing, and then resumed their original course. A lucky shot from a high powered rifle, however, caught one of the big fellows fairly in the body as he was leaping, and the rest vanished instantly. Death, which came after only a hundred yards or so of mad leaps and plunges, left the animal floating, head up, when he was easily gaffed and hauled on board with block and tackle.

The specimen was an adult male seven and one-half feet long and weighed about four hundred pounds. The skin was black on the back, head, and fins, white on the sides and belly and of satin smoothness without signs of bristles or hair as might have been expected, the porpoise being a mammal and not a fish. The skin was uniformly underlaid with a layer of dense hard blubber fully one inch in thickness, as was discovered when the animal was butchered.

Although the mouth is small and practically toothless, the porpoise is evidently a carnivorous animal, as the cardiac stomach contained six recently swallowed sardines of unusually large size—about one foot in length. In addition, the stomach contained about a pint of partially digested material and a quantity of fish scales.

The flesh of the porpoise is very tender, resembling beef in texture but is very dark in color. The flavor is delicate but quite different from any other meat. The body is so thick that the tenderloin supplied a great number of steaks and pot roasts of excellent quality except for the lack of streaks of fat so desirable in beef. The liver was large, closely resembling that of pork liver in flavor, and the heart baked *en casserole* was indistinguishable from that of beef. On the whole, the porpoise would be a valuable food animal if the public palate could be educated to the unusual.—E. H.

HALIBUT EATS LARGE ROCK.

The gray cods are famous all the world over for taking into their stomachs what the fishermen term "ballast," in the shape of stones of various sizes. These are considered necessary to enable the cod to maintain an even keel during the storms which rage on the surface of the sea above them. But it is not as generally known that the halibut (*Hippoglossus*) does the same thing. Due to the kindness of Dr. F. Kermode, director of the Provincial Museum at Victoria, B. C., I am able to reproduce the following letter from a prominent fisherman of Vancouver, B. C.:

"Mr. Walter White, for many years employed as a halibut fisherman on the vessels of this company, and latterly as a mate on our S. S. Kingsway, brought to the office this morning a rock weighing about two and a half pounds. White states that he personally took this rock from the stomach of a halibut weighing about 60 pounds, during August, 1918. The S. S Kingsway was fishing off Bonilla Island at the time, in thirty-five fathoms of water."

The explanation of this lies in the fact that the halibut are famous eaters of small things as well as large things, and they pick from the ground and from the rocks and kelp all sorts of animals, including sea anemones, clam siphons, worms, etc., and in the process of doing so they frequently take in things which were not intended to find a lodging in the stomach of a fish. It is due to reckless eating, not to foresight in taking in "ballast."—W. F. T.

YOUNG OF THE LADYFISH DISCOVERED.

In the April, 1919, issue of CALIFORNIA FISH AND GAME note was made of the abundance of the young of a supposedly rare species, the so-called "king of the salmon." We have another similar case to record here, the young of the ladyfish, *Albula vulpes*, having been taken in numbers in several hauls of a bottom net by our boat, the Albacore. The adult fish is classed as a rarity in the markets, though specimens are usually carefully saved, but the finding of many young indicates that the appearance of scarcity is rather a result of the failure of present modes of fishing to take the adults except as an accident.

The young here mentioned were taken three hundred yards off American avenue, in Long Beach, in from four to five and a half fathoms. They are approximately 7 centimeters (2¾ inches) in length, very transparent and delicate.—W. F. T.

CLAM INVESTIGATION.

The Fish and Game Commission has been fortunate enough to secure the services of Professor Frank W. Weymouth of Stanford University for a short period, beginning April 20 and ending in June. He will be remembered as having done much work on the edible crab (*Cancer magister*) of the Pacific coast. Professor Weymouth will initiate work on the clams of the coast which will prove of general interest, it is believed. The laboratory at Long Beach will be his headquarters.—W. F. T.

SHAD CAUGHT AT SEAL BEACH.

On the twenty-second of April of this year there was what might be termed a "run" of shad, *Alosa sapidissima*, several hundred pounds being brought in on that and succeeding days. They were taken in sardine nets, one of the hauls being taken off Seal Beach. All the fish were of large size.

The occurrence of the shad in the waters of southern California is rather unusual, although several times recorded as far south as San Diego. We are under obligations to Mr. Neilsen of the San Pedro office of the Commission for information concerning the run.—W. F. T.

ALASKA BLACK COD TAKEN NEAR SAN PEDRO.

A specimen of the Alaska black cod (*Anoplopoma fimbria*), 5½ inches long, was taken April 20, 1919, near San Pedro by a sardine fisherman. It has been previously recorded from off Point Loma, near San Diego, by Starks and Morris. It was not recognized by any fisherman in San Pedro, and is apparently a very rare species. Mr. Neilsen of the San Pedro office obtained the specimen for us.—W. F. T.

CANNERY RECEIVES MEXICAN FISH.

There have been several species of Mexican fish brought recently to San Pedro by the Van Camp Sea Food Company. They were obtained near Cape San Lucas by fishermen working for the floating cannery (lately destroyed by fire) belonging to that company, and are noteworthy as perhaps the first fish brought in a fresh condition from so far south. They included the following species:

1. *Caranx hippos*, the "toro," a very dark-meated fish allied to the pompanos and yellowtails.

2. *Neomaenis* sp., the "red snapper," a species closely allied to the snapper of the Gulf States, and hence probably of considerable commercial value.

3. *Nesurus punctatus*, the "cochinito," not generally regarded as of use commercially.

4. *Nematistius pectoralis*, the "pez de gallo," or "rooster fish," a large fish with long dorsal spines, perhaps nearest to the yellowtail (*Seriola*) but dark meated.

5. *Trachinotus rhodopus*, the "pampanito," a pompano of good eating qualities.—W. F. T.

THE BREEDING SEASON OF THE SARDINE.

In view of the general interest in the habits of the sardine, the following general summary of work on its breeding season is presented:

During the years 1917 and 1918, careful examinations of the sardine were made at intervals to observe the state of the roe. As the summer approached, the examinations were made at more frequent intervals. The net result was to prove that throughout January, February, March, and April the ova increased steadily in average size, but that during May the fish which could be termed mature disappeared in large part.

Later, toward the end of May, there appeared what seemed mature fish with spent and regenerating roe sacks. These were, however, in small numbers and had to be carefully culled from the great numbers of small fish brought in. The fair presumption was that the mature sardines had become inaccessible to the fishermen, either through a seaward migration or a change in habit. No spawning sardines were taken at any time.

The discovery of what appeared to be spent fish in small numbers did not, however, prove that the spawning season had passed, or even that it was well under way. That a certain proportion of most species spawn early, and that there is a period when the spawning is at its height, with a following decline, seems probable. If the sardine is such a species, the finding of spent fish merely means the initiation of the spawning period. That this is probably true would appear from the fact that the roe in no case examined was so close to a spawning condition as to justify a belief that it was distant less than a month.

These facts have been entirely corroborated during the spring season of 1919. A series of samples have been collected and examined daily since the early part of May until the date of writing (May 26), and the same succession of changes have been observed.

The young of the sardine under 30 millimeters in length have been taken in the fine meshed nets of the Albacore during the winter months. Pending a careful examination of these younger forms, it is not attempted to decide the time of the spawning season. The only justified conclusion is that spawning fish are not taken in any numbers by the fishermen.—W. F. T.

CONSERVATION IN OTHER STATES.

REFORMS IN NOVA SCOTIA FISHERY SERVICE.

Four years ago there was hardly a river in Cape Breton Nova Scotia, where trout and salmon were not illegally taken with spear or net every year, and in many streams the fishing had been almost completely destroyed. All of the guardians were political appointees; all were poorly paid, and at least three-fourths were neglectful or inefficient. In July, 1914, the Victoria Fisheries Protective Association was organized, and in the fall of that year its officers made an exhaustive report of 12,000 words to the Minister of Marine and Fisheries of the state of the rivers in Cape Breton Island, and the urgent need of reorganization and reform in the fishery service. In this report, which was accompanied by abundant proof in the shape of six or eight voluminous exhibits, the association pointed out the evils of political control; asked for twelve special guardians with increased salaries; suggested that the number of fishery officers in Cape Breton be reduced from 233 to 50 by the dropping of political workers from the rolls, and recommended that in future all guardians be liberally paid and be appointed for merit only, regardless of political influences.

Nearly all of the recommendations have been adopted. The number of fishery guardians has been reduced from 219 to

44; salaries have been more than doubled; the fishery service has been taken out of politics, and the appointment of all guardians has been entrusted to the Civil Service Commission in Ottawa. Guardians hereafter will be selected for merit only; they will do no political work, and they will devote all of their time to an effective patrol of the streams. Thus, for the first time in more than a generation, the fishery service of Cape Breton Island has been put on a business basis. We now have sixteen head guardians with a salary of $70 a month each, and twenty-eight subordinate guardians with a monthly salary of $25 each. The cost of the guardian service is about the same as it was under the old system, namely $10,400 a year; but the government is now paying that sum to forty-eight guardians instead of distributing it among 219.

STURGEON TO BE PROTECTED IN OTHER STATES.

Several years ago it was found necessary to give the sturgeon total protection in California. Other states now realize that this splendid food fish is almost exterminated and are planning to enact protective legislation. So depleted is the supply in Lake Erie and neighboring waters that Ohio, Pennsylvania, New York, and Canada all propose to protect lake sturgeon for a three-year period beginning in 1919. Although once so common that they formed cheap food for the common people, lake sturgeon are now so scarce that only the wealthy can utilize them. Recently sturgeon have been selling up to 45 cents per pound in the New York market.

LIFE HISTORY NOTES.

NESTING OF THE BAND-TAILED PIGEON.

From an old data book of mine I am able to give the following details of the nesting of the band-tailed pigeon (*Columba fasciata*). The record shows that I discovered a nest at the head of the Lopez Canyon, about ten miles east of San Luis Obispo, in San Luis Obispo County, California, on March 30, 1895. The nest, a flimsy affair made of coarse sticks resembling that of a domestic pigeon, but larger in size, contained but one egg in an advanced state of incubation. It was placed on a live oak limb, near the end of the limb but not among thick twigs. As to identification there was no doubt as I was close enough to the bird to observe the cervical white half collar.

From personal recollection I can supply other details. The nest was built in a small oak tree on a steep hillside not over eight or ten feet from the ground and easily reached by stepping up into the tree. I had been in the habit of hunting pigeons in the fall and winter in the vicinity of Atascadero and Santa Margarita and though I used to visit Lopez Canyon every spring for a number of years never observed the birds to remain there in the spring except this one season. On this particular day I saw perhaps half a dozen pairs of the birds around different parts of the canyon which, in those days at least, was probably not visited more than once or twice a year by anybody. I saw one other nest located within a hundred yards or so of the one above described, but placed so far out on slender limbs above the head of the canyon that it was totally inaccessible.—NATHAN MORAN.

WILDCAT EATS BIRDS.

On March 10, 1919, I killed a female California wildcat (*Lynx eremicus californicus*) near Coulterville, California, which had been feeding entirely on song birds. The stomach contained the remains of six western robins.—DONALD D. MCLEAN.

A DEATH STRUGGLE BETWEEN BUCKS.

While hunting mountain lions on April 26, 1919, east of Squaw Creek in Shasta County, California, I came upon

some locked antlers (shown in the accompanying photograph, Fig. 54. The evidence was clear. There had been a fight between two bucks (owners of these antlers), occurring, probably, some time last November. In the heat of the battle their horns had become interlocked so tightly that they fell without disentangling them. The arena for this buck struggle covered an area of about twenty-five square feet in the corner of a meadow bordering on a small mountain lake. The bucks in their fury had trampled down the grass and vegetation and had even in places plowed up the ground with their hoofs. After a desperate struggle either the animals were overcome by exhaustion or famished from hunger and thirst. Winter came on, and coyotes and other predatory animals prowling around in search of something to devour made a delicious meal on their carcasses, leaving, however, the locked antlers in the condition in which I later found them.—JAY C. BRUCE.

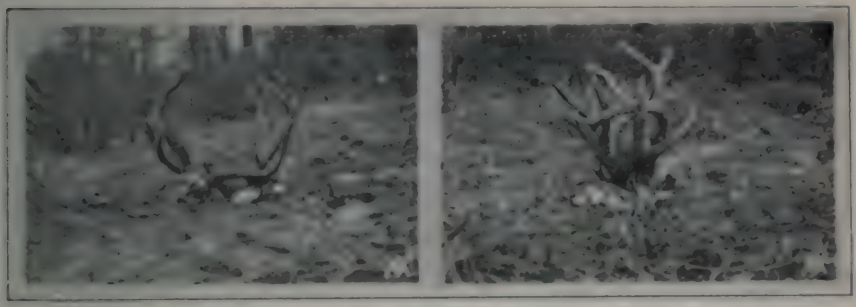

Fig. 54. Locked antlers of deer found on Squaw Creek, Shasta County, by Jay C. Bruce. The death of more than one large buck is due to the locking of the antlers when fighting.

REPORTS.

Canned, Cured and Manufactured Fishery Products of California for the Year 1918, Compiled by Department of Commercial Fisheries.

CANNED

	San Diego, cases	San Pedro, cases	Northern California, cases	Total cases
Abalone—				
1 pound		300	1,425	1,725
Albacore—				
1 pound		17,392		17,392
½ pound		56,214		56,214
¼ pound		9,196		9,196
Anchovy—				
3 pound			1,522	1,522
4 pound			227	227
½ pound			450	450
Barracuda—				
½ pound	24			24
Bonito and skipjack—				
1 pound	705	2,042		2,777
½ pound	2,527	48,382		57,909
¼ pound	12,316	5,395		17,705
Herring—				
1 pound (oval)			58,330	58,330
½ pound			5,817	5,817
Mackerel—				
1 pound		3,450		3,450
½ pound		4,008		4,008
Sablefish—				
1-pound			25	25
Salmon—				
1-pound (tall)			8,205	8,205
1-pound (flat)			3,394	3,394
1-pound (oval)			197	197
½-pound (flat)			22,540	22,540
Sardines—				
1-pound (oval)	17,709	126,632	598,515	747,737
½ pound (oval)	174	3,788	16,244	17,206
1-pound (round)		128,529		128,529
½-pound (round)	1,101	228,139	945	229,340
¼-pound (round)		51,841		51,841
1-pound (square)		50,076		50,076
½-pound (square), tomato	19,508	70,850	3,736	94,094
½-pound (square), oil			4,240	4,240
½-pound (square)			193	193
¼-pound (square)	67,785	78,706	3,997	150,488
Shad—				
1-pound			5,056	5,056
Shad roe—				
½ pound			2,213	2,213
Skipjack—				
½ pound	42			42
Tuna*—				
1 pound	5,788	23,825		29,613
½-pound	41,492	194,744		240,236
¼ pound	2,647	29,464		32,961
4½ pound		268		268
Turtle—				
1-pound	300	199		499
½ pound	100	29		129
Yellowtail—				
1-pound	8,328	2,824		11,152
½ pound	31,707	28,597		60,304
¼ pound	465			465

*Includes some albacore.

Canned, Cured and Manufactured Fishery Products of California for the Year 1918, Compiled by Department of Commercial Fisheries—Continued.

SALTED FISH.

	San Diego	San Pedro	Northern California	Totals
Anchovy—				
Barrels		20	310	330
25-pound cans			2,600	2,600
5-pound cans			1,000	1,000
Barracuda—				
Barrels	450	5		455
Black sea bass—				
Barrels	53			53
Bonito—				
Barrels	12	17		29
Mackerel—				
Barrels	110	280	1,521	2,011
28-pound kit			6	6
Rock bass—				
Barrels	9	42		51
Rock cod—				
Barrels	9	2		11
Sablefish—				
Barrels			72	72
Salmon—				
100-pound tubs			5,955	5,955
65-pound tubs			10,880	10,880
50-pound tubs			12,320	12,320
Salmon—				
Casks (mild cured)			2,700	2,700
Sardines—				
Barrels	2	852	107	961
40-pound barrels			1,252	1,252
25-pound cans			1,200	1,200
18-pound kits			6	6
Sea bass—				
Barrels	29			29
Shad—				
Casks (mild cured)			287	287
Yellowfin—				
Barrels		35		35
Yellowtail—				
Barrels	425	76		501

NOTE.—Casks contain 200 pounds net; barrels, 200 pounds net.

Canned, Cured and Manufactured Fishery Products of California for the Year 1918, Compiled by Department of Commercial Fisheries—Continued.

MISCELLANEOUS PACK AND GENERAL INFORMATION.

	San Diego	San Pedro	Northern California	Totals
Albacore—				
Smoked, pounds		31,420		31,420
Kingfish—				
Dried, pounds		19,000		19,000
Sardines—				
Dried, pounds		37,000		37,000
Scotch cured, pounds		4,000		4,000
Yellowtail—				
Smoked, pounds		1,000		1,000
Fertilizer, tons		1,521		1,521
Fish meal, tons	1,121	3,316	2,874	7,313
Fish oil, gallons	17,400	67,808	261,466	346,674
Number of plants	13	34	40	87
Number of employes	1,497	2,183	3,869	7,549
Value of plants	$1,316,000	$2,773,000	$1,569,320	$5,658,320

California Fishery Products for Year of 1918.

Species of fish	[illegible]	[illegible]	Marin[illegible]	[illegible]	[illegible]	[illegible]	Alameda
Albacore							
Anchovy	100		11,000				
Barracuda							
Bonito							
Bocfecio		1,6[illegible]	2,0[illegible]				
Bluefish							
Chilipepper							
Carp		14,884	8,250	22,[illegible]	60,204	4,[illegible]	8[illegible]
Catfish		90,210		14,371	52,745	4,488	42,15[illegible]
Croakers							
Codfish			10				
Cultus cod	1,648	22,412	6,474				
Dolphin							
Dogfish			78,000				
Flounder	14,793		792	1,522			3,07[illegible]
Hardhead					19,848	7,309	9,50[illegible]
Halibut	30,346	61,[illegible]	1,140				
Hake			8				
Herring	7,311		3,190,[illegible]				1,50[illegible]
Kingfish			10				
Mackerel							
Marlin							
Mullet							
Pike			1,295	404	1,304	730	8,7[illegible]
Pompano			3				
Perch	30,000	258	68,188				10[illegible]
Rock bass							
Rockfish	35,408	6,500	716				
Sole	191		78				
Salmon	1,234,652	1,067,771	172,660	2,376,830	505,854	41,761	2,967,49[illegible]
Smelt	15,200		24,012				[illegible]
Shad (roe)				194,549	35,108		674,29[illegible]
Sea bass (white)			10,921				
Shad (buck)				149,921	13,[illegible]		241,0[illegible]
Sea bass (black)							
Sanddab							
Suckers					6,710	146	2[illegible]
Striped bass			22,773	252,100	114,[illegible]	1,[illegible]	751,[illegible]
Shad			1,[illegible]	224,573	104,814	2,[illegible]	671,[illegible]
Surf fish							
Sturgeon			151,500				
Sardine	908	240	451				
Skipjack							
Skate							
Sheepshead							
Seabass							
Splittail					3,139	3,726	1,11[illegible]
Sea trout							
Swordfish							
Tom cod							
Trout (farm)							
Trout (steelhead)	21,819						
Tuna							
Turbot			2,657				
Whitebait		100	9,297				
Yellowtail							
Miscellaneous	2,000				3,640	3,251	41
Total fish	1,416,665	1,3[illegible]5,625	3,765,345	3,238,026	972,602	71,923	5,449,44[illegible]
Crustaceans—							
Crab (dozen)	4,128						13
Spiny lobster							
Shrimp							
Isopus							
Molluscs—							
Squid			85				
Cuttlefish		100	10				
Clam (Pismo)							
Clam (cockle)			22,652				
Clam (softshell)	1,085	13,105	125,775				178,[illegible]
Clam (mixed)	26,331	1,897	72,842				10,780
Oyster, eastern (shell), number			885,811				
Oyster, native, pounds			39,259				
Abalones	1,935	405					
Sea snails							
Mussels	700		652				4,20[illegible]
Reptiles—							
Terrapin (dozen)			25				

Compiled by Department of Commercial Fisheries.

	50	5,084	918	6,434,770	200	821,854		7,263,806	1,527
		540,323		49,392		9,506		867,851	310
	68,850	37,572	41,185	1,888,066	9,343	1,724,054		3,885,691	951,563
	3,241	6,097	13,046	978,130	868	1,233,087		2,704,164	176,097
	105,261	1,088,074						1,242,770	
	200	69,340		185				70,083	
	80,367	54,022						365,231	
				79,859				312,774	
								264,876	
				56,691		11,635		67,326	
	1,205	11,320		4,221	700			436,937	
	123,505	340,432		1,015	457			915,856	
				741				741	
	500	11,350		14,731		21,771		449,478	2,605
	47,176	25,245		6,079	240	1,291		379,835	
								27,861	
	5,070	25,544	309,378	1,145,734	15,974	1,301,999		2,857,367	1,915,794
	47,316	2,949	64	17,994		8,496		218,672	5,369
	1,400							7,958,780	
	85,342	154,125	734	656,381	349	21,125		975,955	
	973	1,489,163	4,497	2,346,948	6,242	158,283		4,006,906	70,178
				2,276				2,276	
				30,267			30,380	89,597	1,745
								14,965	
	2,732	6,699	44	12,870		107		24,360	
	10,180	6,551	1,010	21,771	374	1,250		108,167	395
			6,396	505,375	5,044	231,293		776,645	7,219
	644,450	1,109,737	122,395	1,575,556	25,512	1,208,043		6,281,425	12,912
	1,891,245	293,569	85,749	52,110	166	4,956		7,027,797	
	396,272	2,692,463		1,865				14,099,076	
	97,950	164,388	30,747	106,859	76,910	46,092		788,923	8,091
								392,864	
	171,885	89,137	61,648	1,915,478	1,064	88,242		1,462,178	154,853
								41,600	
		245	6,184	97,430	2,969	105,599		216,432	38,933
	308,463	41,154		21,970	25			1,751,609	
								7,267	
	47	94						1,467,541	
								1,035,815	
				4,898				4,898	
				300				151,900	
	300,200	64,915,092	42	76,677,612		12,240,235		157,232,571	
	738	155		3,015,082	135	1,145		3,073,847	
	2,040	4,068	435	6,856	28			246,541	
			45	5,005		15,268		25,488	490
		9		25,126		81		25,474	
								7,260	
				4,262	941	246		6,249	
				17,242		580		18,142	
				40,242	139			45,246	
	55					202		2,830	
	1,781							21,819	
								6,240,821	
	315	1,289	1,174	5,897,961		439,241		2,974	
			275	52				125,857	
		81	18,137					11,658,259	139,946
	194,057	147,991	8,762	5,926,021	1,060	5,427,563		339,614	264,163
	1,041	95,842	14,208	139,609	2,175	31,940			
	707	581						67,158	
			99,975	138,706	2,071	42,264		146,736	72,977
								722,178	
	850	801,007		42,976		14,626		861,714	
	4,466	13,288		972				32,739	
	317		605,167					605,484	
			100	31,561				41,262	
								373,842	
				31,060				139,484	
								6,146,021	
								32,750	
		365,566	183,872	60,230				609,668	
				1,462				7,497	
	4,229	600	9,954	21,251	600	580		48,319	835
								25	
						18,135		18,135	12,498

CALIFORNIA FISHERY PRODUCTS.

Compiled by Department of Commercial Fisheries, January, February, March, 1919.

Species of fish	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Solano, Yolo	Sacramento, San Joaquin	Glenn, Colusa, Sutter, Butte	Contra Costa, Alameda	San Francisco, San Mateo	Santa Cruz	Monterey	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego	Imperial	Total	Mexico
Albacore												348		30		378	13,647
Anchovy										9,120		114,540		100		123,760	
Barracuda								13			35,375	87,654		101,468		174,370	454,491
Bonito											50	75,603		3,952		79,605	91,542
Bocaccio								8,656	38,213	408,000						544,339	
Bluefish								9,540		16,172						24,712	
Chilipepper										13,444						13,444	
Carp		5,600		3,332	62,428	80	40,956	335				50				109,841	
Catfish		25,316		3,369	20,486		5,174									50,544	
Coalfish								75			18	182				275	
Cultus cod	300							117,193	18,177	50,246		99				185,915	
Dogfish				11				74,990	295	100	2,589	18,994		55,102		152,081	
Flounder	10,005		454				2,233	64,897	21,243			6,162				104,454	
Halibut	43							16,694	2,652	997	61,731	597,768	12,048	105,622		800,415	175,694
Hardhead					24,744		1,416									26,160	
Hake								483	1,156			9,482		770		11,891	755
Herring	6,419		5,714,688				50,822	476,894	350							4,250,573	
Kingfish			32					21,748	10,687	5,554	994	254,802	43	6,920		300,741	35
Mackerel									29	216,048	164	38,705	33	6,856		261,835	2,640
Mullet															2,359	2,359	
Pike				435	1,419	10	2,502									4,366	
Pompano			2					4	200	200		44,800	32	66		45,304	
Perch	15,824		16,767				46	5,918	9,648	2,008		9,842		12		50,265	
Rock bass												16,033	85	25,478		41,596	6,485
Rockfish	1,196							570,596	159,768	131,955	30,305	699,140	2,716	312,795		1,857,801	39,470
Sole								1,069,544	116,430	14,805	46,636	46,084		4,124		1,296,823	
Salmon	282			40,049	15,208	71,036	157,365	1,646	1,687	216,420						484,493	
Smelt	6,013		11,045				245	71,768	2,012	1,397	1,087	43,366	35,892	28,730		186,855	1,375
Sea bass (white)			719					246	165	135	681	57,267	56	5,963		65,231	3,465
Sea bass (black)												19,899	791	9,651		30,341	815
Sanddab								139,507	11,177	168		2,385		651		153,778	
Suckers					3,276											3,276	
Striped bass			810	62,247	10,702		153,898	20,923								248,580	
Shad, roe				837	81		12,301									13,219	

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CALIFORNIA FISH AND GAME

"CONSERVATION OF WILD LIFE THROUGH EDUCATION"

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SOME NOTES ON DRY-FLY FISHING.

By R. L. M., California.

There is really no mystery in connection with dry-fly fishing; everybody who has fished with the wet fly must have noticed that the first time that a new or dry-fly is cast on the water, that it remains on the surface; in other words, it floats. As soon as the fly becomes wet it ceases to float and thus becomes a wet fly. Now, dry-fly fishing merely consists in keeping the fly dry, and if it should become wet, of drying it with as little loss of time as possible.

Owing to more or less recent discoveries, several aids have been found which greatly assist the fisherman in keeping his fly from becoming waterlogged. The most important of these is the "oil tip." The honor of this discovery belongs to the late Thomas Andrews, of Surrey, England, who obtained it from Colonel Hawker, a descendant of Colonel Peter Hawker (Diary 1802-53; "Hints to Young Sportsmen"). "Odorless paraffine" is the fluid generally mentioned. This is not always easy to obtain. However, there is another oil that from my own personal experience is equally efficacious. I refer to the well known and useful "3 in 1." The best method of applying "3 in 1" to a fly is to dip the fly in the oil, then lay it on a piece of

blotting paper to drain while breakfast is being eaten. A fly treated in this manner will continue to float bone dry until it is worn out or the day's fishing is over.

Another very useful thing to have at the waterside is a piece of amadou. This substance, which looks like leather, is a fungus that has the property of rapidly absorbing moisture. If the fly is *very wet* it can be pressed between a folded piece of amadou and nearly all the moisture is removed.

But all said and done, most of the drying out of a fly is done by switching or casting the fly back and forth in the air. Anybody who is able to throw a fly can in a very short time learn how to do this without snapping off his fly.

The first thing to remember is that the fly should not be thrown *at* the water. Learn how to cast the fly so that all the impetus imparted to the line is used up by the time the fly is still *above* the surface of the water, and allow the fly to fall of its own weight on the water.

Now, when this feat can be accomplished with ease, instead of letting the fly fall on the water, make a backward stroke similar to that which is made when picking the line and fly off the water; this will extend the line behind. A series of three or four of these backward and forward strokes (which are called false casts) are made between each true cast, and this action called "drying the fly" is the principal thing that differentiates between wet and dry-fly fishing. Of course, there are other things to be taken into account, about which I hope to say more at some later date, but the whole secret consists of being able to throw the fly backwards and forwards in the air without permitting it to touch the water in front or the ground behind. When that can be done the major part of the art is conquered.

In actual practice the false casts will be made at an elevation corresponding roughly to the top of the rod, whether the overhead or horizontal cast is being used.

I strongly advise the beginner to commence his dry-fly fishing with hackle flies, for the following reason: A hackle fly, having no wings, is always "cocked up"; whereas, a winged fly should float with its wings standing up in the air, and placing such a fly on the water properly "cocked up" does not come to one overnight. But as soon as the beginner becomes proficient in putting a hackle fly lightly on the water he can switch to the winged variety and note results. If the fly persists in floating on its side, *i.e.*, with one or other wing in the water, it shows that there was too much force used in making the cast; because the fly, instead of falling of its own weight onto the surface, was propelled thereon, with sufficient force to topple it over on its side. As time goes on, however, the fly will more often fall correctly and float lightly on the surface with an extraordinary resemblance to the natural insect.

Do not become discouraged if you do not become an expert dry-fly fisherman in a few days. Have patience and be persevering and in a surprisingly short time, all things considered, you will find yourself accomplishing things you once considered almost impossible. The great test of the art is to be able to tell when a fly is dry or otherwise by the feel of the line when making the false or drying casts. When you can do this your novitiate is in the past.

NOTE ON THE HABITS AND USE OF THE SMALL SAND CRAB (Emerita analoga).*

By FRANK W. WEYMOUTH, Stanford University.

Of the many baits used for surf and pier fishing in southern California, few are more popular than the "soft-shelled" sand crab, of which numbers may be seen for sale in the fish markets on the piers at Santa Monica, Venice, Long Beach, Coronado and other coast towns. Some recent observations on its habits suggested that those who use it as bait might be interested in its mode of life and where it may be caught.

The small sand crab, as it may be called to distinguish it from a larger form also found in the sand, or more technically *Emerita analoga*, is found on sandy beaches exposed to the open ocean along the entire coast of California, but never in bays or other sheltered locations. The reason for this will be clear when we have considered its feeding habits. At the level washed by the waves it burrows in the sand, and is found grouped in beds which can be recognized even at a distance by peculiar diamond-shaped ripple marks in the water running off the sand after the breaking of the wave. These ripples are caused by the feathered "feelers," or antennæ, of the sand crab, which it thrusts up into the receding wave. With these it combs from the water the microscopic animals and plants upon which it feeds.

If one has patience to wade into such a bed and wait quietly until the crabs have recovered from their first alarm, the interesting process of feeding may easily be watched. As the water clears of sand after the inrush of the wave, dozens of pairs of the plume-like antennæ will be seen to pop out of the sand into the seaward-running water, where they remain until the wave drains off, occasionally disappearing for a fraction of a second to be freed of their catch of tiny organisms. Corresponding to this habit of feeding on material too fine to be chewed, the jaws, which have hard cutting edges in other crabs, are here small, soft, degenerate vestiges.

If a shovel is thrust into the sand of one of these "beds" it will turn out scores of these crabs which "dig in" again so rapidly that few can be caught. If numbers are wanted the best way to catch them is to shovel the sand, crabs and all, into a box having wire screen in the sides, and let the sand be washed out by the waves as they sweep in and out. Another but less efficient method sometimes practiced is to hold a screen across one of the sand gullies found in this part of the beach and so catch the crabs which happen to be swimming about in the receding wave.

Observations recently made show that the crabs move up and down the beach with the tides so that the beds may always be found in the area washed by the waves, and here they may easily be recognized by the ripple marks already mentioned.

Crabs caught by any of these methods will be noticed to differ much in size. In this species, unlike most of the crustacea, the males are much smaller than the females, and it will be found during the breeding season, which falls in the summer months, that only the

*California State Fisheries Laboratory, Contribution No. 8.

larger specimens are carrying egg masses. The "soft-shelled" crabs are, of course, not a separate form, but only those that have recently molted or cast their shells, a process occurring yearly in most crustaceans, and that have not yet hardened their new shells. According to observations just made, the molting of the large females apparently occurs just before spawning and in advance of the molting of the males, and it is these "soft" females which are collected as bait for surf fishing. Fish are apparently used to feeding on these crabs, which in their soft state have more difficulty in burrowing into the sand than at ordinary times and are therefore more likely to be found swimming about at the bottom. The fisherman, in using the "soft-shelled" sand crab, is therefore offering to the fish one of its customary dainties, and it is readily accepted.

GAME CONDITIONS IN SOUTHERN CALIFORNIA THIRTY-FIVE YEARS AGO.

By M. HALL McALLISTER.

In 1885, I spent the summer and fall in and near Colton, Riverside and San Bernardino, in southern California, and most of the months of September, October and November in riding and hunting all over that part of California. My companion was a rancher, V. C. Reche, who was one of the best shots, deer trackers and general all-round hunters to be found anywhere.

We had one week's hunt on the Santa Margarita, also known as the Juan Foster-Dick O'Neill-Flood property, near Oceanside. Our party of four bagged fourteen deer and could have killed double the number, but stopped shooting because they were nearly as tame as sheep.

There were then some antelope just south of Riverside, and I have now the horns of a buck killed not far from San Jacinto Mountain, near where the town of Hemet now stands. Mountain sheep could then be found in either the San Bernardino or San Jacinto ranges, and my hunting friend Reche had killed several. I also remember a miner who reported a very large grizzly as coming daily to the mountain side near a mine to feed on the berries. This mine was on the desert side of the Cajon Pass where the Santa Fe Railway comes down from Barstow. Mountain lions were also plentiful all through these ranges. I remember a friend reporting that while riding through a canyon not far from his ranch he suddenly came on a bunch of five lions feeding on a dead calf, and as he had no weapon with him he thought best to make a quiet sneak.

On the San Jacinto plains south of Riverside were a few springs, and to these the quail came in countless thousands to water, and at nearly each one of them we found a brush hut and a V-shaped trough placed there by the quail market hunters. Reche and I went around and burned up each and every one of these "slaughter pens" and got ourselves somewhat disliked when the news leaked out as to who had done it.

When the quail season opened in September we had many splendid hunts, but no potting was allowed, wing shooting only; and with birds so plentiful, we had wonderful sport. I remember one hunt where we slept out at one of these San Jacinto plains springs and in the morning saw the enormous bands of quail coming up for water. It made one's blood tingle with excitement. The ground for hundreds of yards all around was a moving mass of thousands of running birds. We hid in the brush and let them come in to water, then suddenly jumped up with a shout and succeeded in scattering the flock so that in an hour's shooting we had bagged 97 quail, all wing shots. We did not move more than one hundred yards from the spring, as every rock on the hillside had from one to a dozen quail under it.

Mr. Reehe stated that when the Sunset Route of the Southern Pacific started in 1880, many young men in southern California started hunting quail for the San Francisco market, but that nearly all the quail rotted in the sacks before reaching San Francisco, so that the business proved unprofitable. Before refrigeration could be arranged, the big bands of quail were all killed off. He stated that with his brother he started to shoot for the market, but his returns did not pay the express charges and the cost of powder and shot. He stated that by actual count he picked up 363 quail as a result of eleven pot shots of his old muzzle loader at the spring where we found the V-shaped trough. This was an average of 33 birds to each shot, and he said he would wait until the trough was actually covered with quail before he would shoot.

Coming back to recollections in and around my home in San Francisco, I remember that in the summer of 1875 I visited a camp of young men in the mountains back of Pescadero, in San Mateo County. This was in July and there was a game law against shooting quail, but these men, "just for the fun of it," were potting quail by the hundreds and had a large sack full; in fact, so many that their camp could not eat them and we were invited to "help yourself if you will keep your mouth shut."

In the California Market, San Francisco, in the seasonal months from September to February, the oyster cafes served "quail on toast, 25c," and when I lunched there my daily order was this most palatable dish.

Remembering the adage, "You can not eat 30 quail in 30 days," I tried and accomplished the feat. It was supposed the adage came from the idea that a person could not obtain quail on each day of thirty consecutive days or that you would so tire of them that you could not carry out your bargain. However, as stated above, I did obtain and did eat a quail each day for thirty consecutive days. I might state that the restaurant had a fine cook who understood how to prepare them with plenty of butter, and they were delicious.

As I was working and had to keep regular office hours in San Francisco, most of my hunting was on Saturdays and Sundays and occasional holidays and vacations. I have a journal and record book of all my hunts from 1877 down to the present year, 1919, just forty-two years. Most of the shooting has been at ducks and geese on the Suisun marsh, where I was a member of the Cordelia and Ibis shooting clubs.

A CASE OF DESTRUCTION OF PISMO CLAMS BY OIL.*

By PROFESSOR FRANK WALTER WEYMOUTH, of Stanford University, California.

That crude oil is harmful to marine and fresh water animals has been so generally recognized that most states, including California, have passed laws designed to protect their waters from oil by providing penalties for those who allow it to escape. Definite instances proving its destructive effect though present, for instance in the case of water birds, are not numerous, and for this and other reasons convictions are not always easy to obtain. It is claimed by the clam diggers at Pismo and Oceano that oil is chiefly responsible for the decrease in the supply of Pismo clams. It is hoped that at another

Fig. 35. Oil cakes on the beach near Pismo. The size may be judged by comparison with the cap. Photograph by W. E. Weymouth.

time it will be possible to present an analysis of this claim and of other factors influencing the abundance of this important food mollusk, the data for which are not now available, but an instance of the effect of oil which recently came under the writer's notice may here be put on record.

Sometimes oil reaches the beach from tanks on the shore near Avila, but the most important source is from the water ballast discharged by vessels coming to load oil at Port San Luis. This can not reach the beach at Morro around the projecting "Pecho" coast against the prevailing winds, but is blown on the beaches at Pismo and Oceano at times in considerable quantities as bathers at these resorts are

*California State Fisheries Laboratory, Contribution No. 11.

well aware. One such instance was observed by the writer on June 1 of the present year, when along more than a mile of the beach just south of Pismo large masses of fresh oil were found scattered over the wet sand exposed at low tide. The appearance at two points is shown by the accompanying photographs, from which the size and abundance of the oil cakes may be judged. In fact, at this time it was impossible for a bather to cross the beach without getting so much oil on his feet as to make a gasoline footbath necessary. Many old cakes well mixed with sand and free of the thinner oils may be seen at any time high up on the beach, showing that the occurrence is by no means rare. On the date mentioned the lighter parts of the oil, churned up by the surf into an emulsion, were found sweeping back and forth across the sand at the tip of the advancing waves, and in this were large numbers of small animals either dead or so feeble as no longer to be able to burrow. About a quart of small clams, chiefly razor shells (*Siliqua*), but including some thirty small Pismo clams (*Tivela*), together with a few sand crabs (*Emerita*) and some worms were picked up in a few minutes. All were smeared with oil; some of the clams were dead and gaping, others were alive, but too feeble to keep up the constant burrowing necessary to maintain their place in the sand from which the waves had washed them. Whether the oil killed them directly or, what is more probable, by filming over the sand cut off the supply of air, could not be determined. But that they were killed by the oil can not be doubted, as examination of the beaches for two or three weeks before and after this date seldom showed even a single dead clam except in the presence of oil.

With this clear proof of the destructive effect of the oil on such an important food animal as the Pismo clam, there can be no excuse for tolerating the escape of oil, especially as it has been proved possible by devices in use on many tankers not only to prevent its escape, but to save the oil thus usually lost.

If you are inclined to criticise the Fish and Game Commission, read the following criticisms and the defense.

If you believe in the work of the Commission, inform yourself more fully as to the accomplishments of the past few years.

ACCUSATIONS AND THE DEFENSE.

Resolution by Mr. Eden, Introduced in the State Legislature April 1, 1919, and referred to Committee on Governmental Efficiency and Economy.

WHEREAS, The Fish and Game Commission of this state, and its several members, officers and assistants, are, by virtue of the very large power and authority given to them by law, in a position to exert great influence for or against legislation pending before this Assembly; and

WHEREAS, It is said that certain of said officers and members have in fact sought to influence pending legislation; and

WHEREAS, Said Fish and Game Commission and certain of its members, assistants and employees have been derelict in the performance of the duties imposed upon them by law; now, therefore, be it

Resolved, That the Committee on Efficiency and Economy of this Assembly be and it is hereby, directed to make an immediate and thorough investigation of the following specific matters:

1. To ascertain what, if any, fishing clubs, gun clubs and private game preserves, any of the said commissioners, or the officers, assistants or employees of said Fish and Game Commission, are affiliated with; and whether or not any of said officers, assistants or employees have been, by reason of such affiliation, pernitciously active in supporting or opposing any legislation now pending before this Assembly; and whether or not they have shown any favoritism, in any manner, towards any gun or fishing club members; and whether or not they have, by reason of their said membership, sought to set up and perpetuate in this state, against the interests and wishes of the common people, the European system of a monopoly in the control and use of wild fish and game, which is peculiarly the property of all the people.

2. Why it is that within the past nine years said commission has, without any satisfactory explanation, dismissed three certain executive officers of said commission, each of whom was reputed to be a faithful and efficient public servant.

3. How much of the time of the present attorney of said commission is devoted to the duties of his state office, and how much of it is devoted to his own private law practice; the latter of which is said to be very large and lucrative.

4. Why said commission collected from the people of the State, during the four years ending June 30, 1918, the enormous sum of $837,469.25, of which the sum of $708,310.75 was expended; whether or not said sum so spent was not unwisely and extravagantly used. Also recommend some legislation that will reduce the amount of money collected by said commission at least $40,000 per annum. Also to ascertain if it is not advisable that the expenditure of such a large fund should be made by the governing body of the State, upon appropriations, instead of by said commission, as is now done, without any control of the Legislature whatever.

5. Why it is that for the two years ending June 30, 1918, the police work of the commission fell off about 15 per cent over the preceding two years (see last report to Governor, page 88); notwithstanding said commission is charged with the enforcement of laws for the preservation of fish and game, and notwithstanding more people hunted and fished during said period ending June 30, 1918, than before; and notwithstanding reports of frequent and flagrant violations of the fish and game laws were reported in the press and otherwise throughout the state.

6. Why said commission expended the enormous sum of $68,272.21 to establish and a large sum since for additions to a trout hatchery in Inyo County, for the purpose, as avowed by the said commission, of stocking the streams of southern California and the western slope of the southern Sierra Nevadas, when it was obvious to any person that said location could not be a success for the following reasons:

a. That there were no waters nearby needing to be stocked.

b. That it was impossible to obtain a sufficient supply of trout eggs in that vicinity for hatching purposes.

c. The great distance the hatchery product must be transported at heavy expense.

d. The hatchery product must be transported through the heat of the Mojave desert before they reach the waters intended to be stocked.

7. To ascertain the cost of maintenance and operation of said hatchery in Inyo County, and whether the said cost is not extravagantly expensive and out of all proportion to the benefit derived by the people of the state, and likely to be a growing burden and expense; also the person from whom the ground was purchased and the then owners of adjacent property and the price paid therefor.

8. To ascertain whether or not the commission is making any intelligent and sufficient effort to obtain accurate first-hand information relative to the present status and condition of the game and fish of the state, and whether or not by reason of failure to procure such information many species of game and fish have reached the point of actual extinction, with others in the same dangerous stage of diminution, before proper conservation measures can be proposed to this Assembly.

9. Why said commission has permitted the Truckee River, one of the most beautiful streams in the world, and a famous fishing ground, to remain polluted for years by the waste products from a paper mill located at Floriston, California, notwithstanding popular complaint and objection by the citizens, not only of our state, but also by the people of our sister state, Nevada, whose principal city obtains its domestic water supply from said river; and notwithstanding said commission is required by law, and clothed with all lawful authority, to prevent the pollution of streams. Why it is that in the face of the law said commission has deliberately and wilfully failed and refused to do its plain duty, thereby constituting a clear and flagrant malfeasance in office, and one that should be severely dealt with by the proper authorities.

10. Why it is that the ocean waters of San Luis Obispo County and the waters of San Pablo and San Francisco bays, and other navigable fishing waters in the state, have been for years, and are now, being polluted with crude petroleum, oil refinery refuse and other substances deleterious to fish life, in violation of law; notwithstanding it is the duty of the Fish and Game Commission strictly and impartially to enforce the law against such pollution.

11. To ascertain whether or not, throughout the state, in irrigated districts, many canals and irrigating ditches are diverting water from streams that contain fish, without using screens to prevent the loss of fish; and thereby millions of trout, bass and other valuable food and game fishes are annually killed and wasted.

12. To ascertain to what extent dams and other artificial obstructions are being suffered by the said commission to be maintained in the streams of the state without proper fish ladders, and whether or not by such neglect and dereliction of duty on the part of said commission, millions of trout, and other migratory fish, are prevented from reaching proper "spawning beds," with a resultant loss of a great quantity of fish spawn and fish.

13. To ascertain if it is not true that the Fish and Game Commission has failed and neglected to take advantage of that provision in the law authorizing the creation of game refuges on private land holdings, resulting in game, in many sections where hunting is intensive, failing to receive proper and adequate protection.

14. Why said commission has discontinued a branch office established at the request of the people of the San Joaquin Valley; thus making less effective the supervision of police and other conservation activities in that important and developing region; and thereby, and through other activities, having lost to the state the services of one of the most efficient and conscientious fish and game conservationists in the country.

15. To ascertain if it is not true that said commission has wasted large sums of the people's money in unscientific and impractical experiments at its game farm at Haywood, California, and has finally abandoned said farm.

16. To ascertain if it is not true that the distribution of fish, as carried on by said commission, is unscientific, unduly expensive and results in the destruction each year of a large proportion of the fish so distributed.

17. To ascertain if it is not true that because said commission has failed to investigate and prevent enormous losses occurring among the millions of young salmon propagated and distributed each year after they leave the hatcheries, the salmon fisheries of the Sacramento and San Joaquin rivers are not being kept in a healthful and thriving condition.

18. To ascertain to what extent, if any, said commission has, within the past eight years, been governed by political, personal and other insufficient and improper motives, in its acts in the following particulars:

a. The dismissal of trained and efficient employees.

b. The employment, promotion and otherwise rewarding of assistants and employees not deserving of such consideration.

c. The failure to promote certain assistants deserving promotion.

And whether it is not true that by reason of said acts the entire department is demoralized and functioning very inefficiently and at an expense out of all proportion to the results obtained.

19. To ascertain if it is not true that the force of wardens in the field, where the fish and game are to be found and where constructive work can only be done, is inadequate; while the "overhead" has been constantly increased by adding to it expensive and unproductive clerical workers; be it further

Resolved, That said committee report to this Assembly within a short time, the result of its investigation, with such recommendations as it may deem advisable, be it further

Resolved, That said committee be, and it is, hereby authorized and empowered to compel the attendance of witnesses at its several sessions, by subpoenas, to be served by the clerk of said committee; and that the chairman and vice chairman of said committee be and they are each of them authorized to administer oaths to witnesses; and any witness refusing to answer questions is hereby declared to be in contempt, and may be punished as for contempt.

Said committee is empowered to employ all needed clerical and expert assistance to carry on said investigation, and all costs and expenses of such investigation shall be paid out of the Contingent Expense Fund of this Assembly, not exceeding one thousand five hundred dollars.

Reply to the Eden Resolution by the Executive Officer of the Fish and Game Commission.

In the preamble of Mr. Eden's resolution introduced in the Assembly, April 1, 1919, it is stated that some of the members, officers and assistants of the Fish and Game Commission appear before the Legislature. While this is true, they do so merely in an advisory capacity and have not at this or any other session of the Legislature, attempted to influence any legislation for personal motives. They have favored the legislation which they thought was best for the conservation of the fish and game of this state and have opposed legislation which, in their opinion, was harmful or vicious.

A general statement is made that certain members, assistants and employees of the commission have been derelict in the performance of the duties imposed upon them by law, but no specific instances have been enumerated. The statement is untrue. Assistants or employees found derelict in the performance of their duties have been promptly discharged from the service of the commission.

The following is a brief reply to each of the nineteen points set up in the resolution:

1. The fact that two of the three commissioners are members of gun clubs has in no way influenced them in showing any favoritism towards gun clubs nor have they been pernitiously active in supporting or opposing legislation pending before the Assembly, nor have they sought to establish the European system of monopoly in the control and use of fish and game, against the interests and wishes of the common people. On the contrary, they have always sought to perpetuate fish and game in this state for the benefit and use of all the people. Commissioner Bosqui is not a member of nor in any way affiliated with any hunting or fishing club nor with any game or fishing preserve.

2. It is not true that within the past nine years the Fish and Game Commission has dismissed three executive officers of the commission. Charles A. Voegtlang severed his connection with the commission long before Commissioners Newbert and Bosqui were appointed and several years prior to the time the present executive officer became connected with the commission.

John P. Babcock, after several conferences with Governor Hiram W. Johnson, resigned on November 24, 1911.

Ernest Schaffle voluntarily resigned on September 15, 1916. Both resignations are now on file in the office of the commission.

3. Mr. Robert D. Duke, attorney for the commission, devotes all of his time to the duties of his state office.

4. During the four years ending June 30, 1918, the Fish and Game Commission collected the sum of $837,469.25, because under the laws of the state, it was its duty to collect said sum. This money was paid into the Fish and Game Preservation Fund by hunters, anglers and commercial fishermen who desired that it be used for the purpose of conserving fish and game and not that it be diverted into the general fund to be used for other purposes. It is their wish that these funds be spent on patrol, enforcement of fish and game laws, erection and maintenance of hatcheries, distribution of fish, installation of screens in ditches, fishways in dams and research, etc.

The fish canners and commercial fishermen, of their own accord, asked that a privilege tax be imposed on the taking of fish and that the money from this source be turned over to the Fish and Game Commission for the purpose of conducting investigations of the life history of fishes in order that the commercial fisheries might be further developed, new methods of fishing experimented with and proper legislation passed in order to conserve the fishes of this state.

Accounts of its receipts and expenditures are published more frequently by this commission than by any other state board or commission. "California Fish and Game," published by the commission quarterly, contains a full statement of all money expended by this commission each month, besides an account of the commission's other activities.

That the funds of the commission have not been unwisely or extravagantly spent is proven by the results obtained. The salmon run, which in the early '80s was practically exterminated by mining operations, was restored by the work of the

commission's hatchery department, so that in 1918 over twelve million pounds of salmon were caught, which retailed at an average price of 25 cents per pound, making the total value of the catch $3,000,000.

Striped bass, catfish, black bass, shad, blue gill, calico bass and other food fishes were introduced into the waters of this state by the Fish and Game Commission. As a result of this work, 1,400,000 pounds of striped bass were caught in California in the year 1918. They were retailed at about 25 cents per pound, or $325,000. During the last three years over twelve million pounds of shad were taken in California, from thirty to sixty-five carloads of roe shad being shipped to the Eastern markets each year, retailing at not less than 20 cents per pound, making an average of $500,000 per year.

Catfish are also caught in large numbers. In 1918, 200,000 pounds, worth 25 cents per pound, or $50,000, were sent to our markets. The annual catch of these four species of fish introduced or re-established by the Fish and Game Commission is valued at $4,175,000. In fact, a total of 250,000,000 pounds of fish were caught in California during the year 1918. The fish packed by canners and curers, alone, were worth approximately $20,000,000, to say nothing of the fresh fish sent to the markets.

Surely an industry of such magnitude is worth protecting, and any money spent in investigating the life history of our food fishes can not truthfully be said to be extravagantly spent without achieving results, particularly when the fish introduced, propagated and protected by the commission bring into the State of California, $4,175,000 per year—over ten times the amount expended by the state in the protection, propagation and conservation of all fish and game.

As a result of the investigations by the experts of the commission, a new season and limit was adopted and the catch of crabs increased 40,000 dozen per year, valued at $200,000.

Besides the important work of the Fish and Game Commission in propagating and conserving commercial fishes, it has also propagated and distributed millions of trout and has stocked many waters which had been entirely barren of fish life. Bear Lake, an artificial lake in San Bernardino County, about eight miles long, was stocked by the Fish and Game Commission. Hatcheries and egg taking stations were built and maintained there and the supply of fish kept up so that now the fifty or sixty thousand people who visit the lake annually obtain excellent fishing. In addition to Bear Lake, the commission has also planted trout and black bass in Huntington Lake, Rose Lake, Shaver Lake, Clear Lake, Juniper Lake, Medicine Lake, Rea Lakes, Sixty Lake Basin and many other lakes throughout the Sierra Nevada and the Coast Range mountains, too numerous to mention. In all of these lakes excellent fishing is to be had and they are annually visited by tens of thousands of anglers.

Innumerable barren streams in the Sierra Nevada Mountains and elsewhere in the state have been stocked with trout. All of the streams in the Yosemite National Park above the floor of the valley were barren of fish life before they were stocked by the Fish and Game Commission. Golden trout have been distributed from Volcano Creek throughout the Sierra Nevada Mountains, as far north as the Yosemite Valley.

The fishing in some of our best streams is kept up solely through the work of the Fish and Game Commission. When the run of black-spotted trout, the only trout indigenous to the Truckee River, was stopped by the dams in the river in the State of Nevada, the Fish and Game Commission planted Rainbow, Eastern Brook and Loch Leven trout in this most excellent fishing stream, so that, now, while black-spotted trout are seldom, if ever caught, excellent catches are made of the varieties introduced by the Commission.

The banks of the Sacramento River on Sundays and holidays, in fact, nearly every day, are lined with anglers fishing for catfish, crappie, blue gill, calico bass and other game fish introduced into the waters of this state by the Fish and Game Commission.

The work of the Fish and Game Commission in the protection of the game resources of the state has also been productive of excellent results. Deer are admittedly much more numerous now than they were ten or fifteen years ago. Cottontail rabbits are becoming so numerous that the residents of Fish and Game District No. 2 and Fish and Game District No. 4 have asked this Legislature that the protection given cottontail and brush rabbits be removed and that they be placed upon the list of predatory animals which may be taken at any time.

As a result of the protection given pheasants, these planted by the commission have become so numerous in favorable localities, that open seasons for the taking of these birds are demanded in Inyo and other counties and will probably be granted by this session of the Legislature.

Quail and doves are holding their own in most localities. Wild ducks and wild geese, under the protection given them both by the state and federal governments, are so numerous that in many localities, they are considered a pest, particularly in the rice fields of the Sacramento Valley and the grain fields in the lower San Joaquin Valley. In fact, there is now pending in the Legislature a bill providing that the protection given ducks and geese be, to some extent, removed, in order that the farmers of the state may obtain relief from their depredations.

5. The diminution in the number of cases made in the biennial period 1916–1918, is due to the vigorous campaign of education being carried on by this commission. The commission feels that it can obtain much better results by educating the people to a proper observance of the laws for the conservation of our fish and game, than it can by arrests alone. Apparently the commission is justified in this. Despite the fact that the patrol has been more efficient than at any other time, the number of arrests have decreased from 2,087 in 1914–16 to 1,757 in 1916–18. Among the activities of the Department of Education and Publicity which emphasize the motto, "Conservation through education," are:

a. "CALIFORNIA FISH AND GAME," a quarterly magazine devoted to the conservation of fish and game in California, published, contains—

(1) Numerous articles on game species, means of identifying them, their past and present status and the means whereby they may be conserved.

(2) Statistics bearing on the abundance of game species.

(3) Reports of work accomplished by commission; activities initiated.

(4) Financial reports.

b. Publicity items in newspapers dealing with fish and game and the activities of the commission.

c. Magazine articles, *e.g.* "A New Goose for California," "Pernicious Bounty Laws."

d. Lectures on fish and game and its conservation illustrated with stereopticon and with motion pictures, given to schools, churches, teachers' institutes, boy scouts, summer camps, etc.

(1) Special series of lectures to university students.

e. Exhibits showing work and activities installed at State Fair and sportsmen shows.

f. Instruction relative to fish and game and the need and value of wild life conservation given in schools by means of lectures and trips afield.

(1) Teacher's bulletins issued furnishing teachers with usable information.

(2) Similar instructions given boy scout organizations at their summer camps.

g. Record of activities and accomplishments furnished the Governor and the people of the state through the medium of a biennial report.

h. Information on wild life furnished in reply to letters of inquiry.

The decrease in the number of cases can also be accounted for by the fact that at the 1917 Legislature, the sale of trout was prohibited, thus eliminating the many arrests that had theretofore been made of fishermen who caught trout for the market and who continually violated the law regarding both seasons and limits.

Furthermore, on account of the vigorous prosecution of cases by the commission, many violators have ceased to disobey the laws. For example, after Judge Murasky decided the case of *American Game Transfer* vs. *Fish and Game Commission* in favor of the commission, the merchants who had theretofore sold wild ducks illegally, practically quit doing so, and market hunters from whom they procured wild ducks discontinued their unlawful shipments.

6. At the urgent request of the anglers of southern California, the commission decided to build a hatchery to stock the streams and lakes of southern California and the western and eastern slopes of the southern Sierra Nevada Mountains, which were fished annually by thousands of people from Los Angeles and other portions of southern California. It emphatically and repeatedly demanded in writing of the Department of Engineering and Board of Control that the building should not cost more than $30,000. Plans and estimates were submitted by the State Architect, calling for a building to cost $29,500.

At a meeting held in the office of the Fish and Game Commission in the Mills Building, San Francisco, attended by John Francis Neylan, then President of the Board of Control; Mr. Dean of the State Architect's office; Frank M. Newbert, M. J. Connell, Carl Westerfeld, Fish and Game Commissioners; Ernest Schraeble, Secretary of the Fish and Game Commission, and Mr. W. H. Shebley, Superintendent of Hatcheries, the commissioners attempted to question the representatives of the State Architect on the estimates submitted and were told emphatically by Mr. Neylan that neither he nor the representatives of the State Architect or the Department of Engineering or its officials, came to the commission to have their ability to estimate the cost of a building questioned by laymen; that the law provided that the amount set aside for the building must be turned over to the Department of Engineering and that if the plans were satisfactory, the commission would have nothing further to say about its construction. Furthermore, if the commission did not turn over $30,000 to the Department of Engineering, as provided by law, the Board of Control would not approve of the expenditure of one cent and the commission could not build the hatchery. Thereupon, the commissioners turned over $30,000 to the Department of Engineering, which assumed full charge of the construction of the building.

Before asking for plans and specifications for the hatchery to be built in Inyo County the Fish and Game Commission made an extended survey of all the streams in southern California, in order to obtain the best site possible for a hatchery. The temperature of the waters of numerous creeks was taken; the minimum and maximum

flow determined; the transportation facilities were examined; the needs of the surrounding country were investigated. After a most exhaustive examination, the present site on Oak Creek was chosen, and the results have fully justified the choice made. In view of the fact that nearly all the water in southern California was appropriated for irrigation, power or domestic use, the state was extremely fortunate to obtain such valuable water rights free of cost. These alone are of much greater value than the cost of the hatchery.

The fish produced at the Mt. Whitney Hatchery show much greater and better development than those propagated at any other in this state or anywhere in the world. The facilities for stocking the waters of the southern Sierras and southern California are better than these that could be obtained anywhere else in that section of the state and the people who are informed, are all of the opinion that no better site could have been chosen.

a. It is not true, as stated in the resolution, that there were no waters nearby needing to be stocked. On the contrary, there are numerous streams and lakes both on the western and eastern side of the southern Sierras, some of which are barren of fish life, in which trout ought to be planted. The headwaters of many of the streams flowing into the southern San Joaquin Valley rise in the western slopes of the Sierra Nevada, within easy range of the Mt. Whitney Hatchery.

b. It is not true that it is impossible to obtain a sufficient supply of trout eggs in the vicinity of the hatchery. On the contrary, an ample supply of trout eggs can be obtained from Rae Lake and Bear Lake, besides a bountiful supply of golden trout eggs from Cottonwood Lake, the only place in the world where these eggs can be obtained. In any event, it is much cheaper and easier to transport eggs to Mt. Whitney Hatchery to be hatched and distributed than it is to transport trout fry from Mt. Sisson Hatchery to the streams and lakes stocked from the Mt. Whitney Hatchery.

c. It is not true that the hatchery product must be transported a great distance or at a heavy expense. The lakes and streams of the southern Sierras and southern California can be easily reached and cheaply stocked from the Mt. Whitney Hatchery.

d. The hatchery product is loaded on the fish distribution cars at Owenyo, leaves there about five o'clock in the evening, and passing through the Mojave Desert at night, reaches Los Angeles and the southern portion of the San Joaquin Valley early the following morning.

e. The cost of maintenance and operation of the Mt. Whitney Hatchery is not extravagantly expensive nor out of all proportion to the benefit derived by the people of the state. From year to year the expense, instead of growing, will diminish on account of better facilities and the probable decrease in the price of food for fish.

The ground on which the hatchery is located was not purchased by the state, but was given to the state by the citizens of Inyo County. The commissioners are not aware who are the owners of the property adjacent to the hatchery site. At the time the hatchery was built, the land adjoining it immediately on the west was a part of the National Forest, owned by the United States.

The Fish and Game Commission of California has made a greater effort than any other state in the union to obtain accurate first-hand information relative to the present status and condition of the game and fish of the state. It has caused extended scientific research to be made, both as to the life histories of our game and our fishes.

Under the direction of Dr H. C. Bryant and J. S. Hunter, the following investigations have been instituted:

a. Researches are being carried on by H. C. Bryant, Ph.D., game expert of the commission, and J. S. Hunter, in close co-operation with the University of California, Museum of Vertebrate Zoology, facilities and advice of the trained scientists of the university being available and used.

b. Dr. Bryant, joint author of "The Game Birds of California," a 600 page book, published in 1918, detailing the life history, habits and past and present status of each species of game bird found in the State, sums up present knowledge of each species.

c. Investigations of the food habits of birds:

(1) Roadrunner proved an efficient destroyer of insect pests rather than an enemy of quail. Actual food consumed shown by stomach analysis.

(2) Study of food of ducks in progress. Will furnish information as to their relation to agriculture and will give evidence as to best food plants to attract wild fowl to the State. Natural foods suitable for use by the game breeder will also be apparent.

d. Compilation of dependable facts regarding game and its status. File kept; information furnished by forest officers collated; newspaper articles authenticated.

(1) Special report on fur bearing mammals; past and present status.

(2) Present status of beaver with map showing known distribution.

(3) Present status of prong-horned antelope with map showing present distribution and census of existing herds.

e. Statistics of annual kill of game.

(1) Deer. Estimate made from actual report of kill made by deputies and forest officers.

(2) Ducks. Estimate made from records showing shipments to market.

f. Investigations of disease attacking game.

(1) F. C. Clarke—disease attacking deer in Trinity County, proved to be a bladder worm.

(2) Dr. Bryant—disease attacking ducks in Sutter County, 1918.

g. Investigations of birds in relation to agriculture.

(1) Ducks versus rice. Joint investigation by Biological Survey and Fish and Game Commission.

(2) Blackbirds versus corn and other crops.

(3) English sparrow versus garden crops and beneficial native birds.

(4) Relation of meadow lark to agriculture.

h. Field investigations of game refuges.

(1) Trinity County Game Refuge; present condition; predatory mammals.

(2) Pinnacles Monument Game Refuge; present condition; predatory mammals.

i. Study of acclimatization of exotic species. Success and failure in the introduction of foreign game birds and mammals.

j. Study of methods of conserving wild life.

k. Scientific investigations of deer and their status in California by F. C. Clarke.

The following scientific investigations of the commercial fisheries of the state have been carried on, and many of them are still in progress under the direction of Mr. N. B. Scofield, in charge of the Department of Commercial Fisheries.

a. Investigation of Albacore, Sardine and Herring. Mr. Will F. Thompson, formerly with the Department of Fisheries of British Columbia, at present fishery expert in our laboratory at Long Beach, is making a scientific investigation of the life history of the albacore, together with a statistical analysis of the catch. He is also making a scientific study of the sardine and herring, as well as observations on a great many other fish. The greater part of the time, however, is spent with the albacore and sardine, in order that we may be prepared to cope with the many problems arising with the rapid development of these fisheries.

Mr. Elmer Higgins, who is a graduate of the Department of Zoology, University of Southern California, is assisting Mr. Thompson in the laboratory, collecting specimens and conducting experimental fishing trips on the patrol launch "Albacore."

b. Edwin Chapin Starks, assistant professor of zoology of the Leland Stanford Junior University (formerly curator of the museum, and instructor at the University of Washington), is writing a series of comprehensive articles on the results of his studies of the various fishes of this coast, which appear in our magazine, "CALIFORNIA FISH AND GAME," *i.e.*,

The Flat Fishes of California.
The Mackerel and Mackerel-like Fishes of California.
The Herring and Herring-like Fishes of California.
The Sharks of California.
The Skates and Rays of California.

c. Salmon. Arrangements have been made to complete the investigations of the life history of the salmon from Monterey Bay to the northern boundary of the state. Mr. Willis Rich, a well-known student in zoology, and J. O. Snyder, associate professor of zoology, Leland Stanford Junior University, formerly Assistant United States Fish Commissioner, naturalist U. S. S. "Albatross" and expert ichthyologist, will carry on the work. Mr. Rich has already completed a great deal of work on the salmon and Dr. C. H. Gilbert of Leland Stanford Junior University has carried on extensive experiments for the commission in marking and planting salmon fry.

d. Crab. A study of the Pacific Coast edible crab (*Cancer magister*) was made by Frank Walter Weymouth (assistant professor of physiology, Leland Stanford Junior University, A. B. Stanford 1909, A. M. Stanford 1911. In 1912 and 1913, assistant in physiology at the Johns Hopkins University), in the year 1911. As a direct result of his findings the size limit of crabs was increased by law and the catch of crabs in 1917 was increased 50 per cent over that of 1916.

e. Mollusks. In 1911 a complete survey was made of the California coast under the direction of Prof. Harold Heath, professor of zoology, Leland Stanford Junior University (A. B. Ohio Wesleyan, Ph.D. Pennsylvania), covering the mollusks of this region. W. W. Curtner, Will F. Thompson and Mr. Hubbs assisted in this work.

f. Crawfish. A crawfish investigation was made in 1911 by Bennett M. Allen of the University of Wisconsin. Later Waldo S. Schmidt of the United States National Museum came to this coast, and in 1918, with the assistance of our men and boats, was able to secure some specimens of young crawfish which will greatly assist him in his report of their life history.

g. Abalones. Mr. W. W. Curtner has made a complete study of the abalones of the State. Mr. Curtner is a graduate in zoology of the Leland Stanford Junior University.

8. Striped Bass, Sturgeon, Perch, Shrimps, etc. Mr. Scofield has himself conducted a great many investigations of our fishes, such as the shad, striped bass, perch, sturgeon, etc. He has also made a study of the shrimp fishery and has been able to prevent the use of the destructive Chinese method of shrimp fishing.

9. Kelp. During the Great War, when a sufficient amount of potash was not obtainable even at the increased price of $300 and $400 a ton, formerly $65 per ton, a study was made of the extensive kelp beds along the coast of southern California with the assistance of Mr. W. C. Crandall of the Scripps Institution and Dr. F. W. Tarrentine of the United States Department of Agriculture, and regulations were made as a result of this study which enabled the harvesters to cut the kelp to the limit without unduly destroying the beds.

9. There is less than eight miles of the Truckee River in California below Floriston. Shortly before the present Board of Fish and Game Commissioners was appointed, the State of Nevada appropriated $10,000 to abate the nuisance caused by the pollution of the Truckee River at Floriston. Nevada's chief complaint was not that the alleged pollution was deleterious to fish life but that it rendered the water supply of the city of Reno unpalatable.

An action was commenced by the State of Nevada in the United States courts in San Francisco and much testimony was taken. It was not proven that the refuse was deleterious to fish. In fact, the testimony showed that the fish in the river below the point at which the refuse was discharged, were in good condition and fit for human consumption. The action commenced by the State of Nevada was thrown out of court. Thereafter, certain state officials of Nevada consulted with the Fish and Game Commission of California, with a view to abating the nuisance. F. A. Shebley and N. B. Scofield were sent by the commission to the Truckee River to make further experiments with the water affected. Numerous conferences were held and a committee consisting of W. H. Shebley, Superintendent of Hatcheries in California, Professor Dinsmore, Bureau of Chemistry, University of Nevada, and Mr. Block, representing the paper company, was appointed to go east at the expense of the paper company to investigate certain appliances to handle the refuse. The owners of the paper company agreed to install these appliances providing the manufacturers thereof would guarantee their efficacy. When the manufacturers would not do this, the matter was again taken up by Governor Boyle of Nevada and Mr. Thatcher, Attorney General of Nevada, with Governor Hiram W. Johnson of California, and Mr. Westerfeld.

As a result of this conference, a committee consisting of Hon. Arthur Arlett and W. H. Shebley, again investigated the condition of the river below Floriston and made its report to Governor Johnson. Mr. Westerfeld thereafter wrote Governor Johnson, asking that the Attorney General of the State of California be instructed to commence proceedings under the authority of *People* vs. *Truckee Lumber Company*, 116 Cal. 397, against the paper company to abate the nuisance. At the next session of the Nevada Legislature, another appropriation was granted by that state to again commence proceedings against the paper company. An action was thereupon instituted and is now pending in the Supreme Court of the United States.

10. Water Pollution. Practically nothing was done by previous boards of Fish and Game Commissioners to prevent pollution of the waters of the state. The present board has, however, made great strides in this work and it is safe to say that California now leads any other state in the Union in preventing the pollution of its waters.

In the last ten years many complaints have been filed in the courts against large corporations and individuals to stop the discharge of refuse matters into the waters of the state and vast sums of money have been expended by them in order to remedy the evil. For example, as a result of complaints filed in the courts by the Fish and Game Commission, the following named companies have expended the amounts set opposite their respective names to prevent pollution:

Pacific Gas and Electric Company	$200,000 00
Union Oil Company	18,000 00
Shell Company of California	40,000 00
Doheny-Pacific Petroleum Company and Associated Oil Company, jointly	20,000 00
Mason Malt Whiskey and Distilling Company	7,000 00
Southern Pacific Company	23,000 00
Monarch Refining Company	5,000 00
American Oriental Refining Company	2,000 00
Capitol Refining Company	1,000 00
Paraffine Paint Company	1,000 00
California Petroleum Company	1,200 00
Total	$318,200 00

Many fines have also been collected as a result of prosecutions commenced by the commission.

Other large companies which have complied with our requests, or demands, without prosecution, are as follows:

Standard Oil Company	$500,000 00
Southern Pacific Company	25,000 00
Northwestern Pacific Railroad Company	5,000 00
Coast Counties Gas and Electric Company	5,000 00
Coast Valleys Gas and Electric Company	3,000 00
Pacific States Refining Company	2,000 00
Atchison, Topeka and Santa Fe Railroad Company	2,000 00
Western States Gas and Electric Company	5,000 00
	$548,000 00
Brought forward	318,000 00
Grand total	$866,000 00

And in addition a large number of smaller companies and individuals have been compelled to cease pollution where such existed. In all cases where persons, firms or corporations have failed to comply with our demands they have been taken into court.

Three cases are now pending in the courts of San Luis Obispo County, two against the Union Oil Company for pollution of San Luis Bay, and one against the Tiber Pacific Company.

11. Screens. Prior to 1912 no systematic effort was made to cause the installation of screens and ladders. At that time the present commission created a department of screens and ladders and detailed two men to attend to this work under the supervision of the Superintendent of Hatcheries. Since that time, despite the fact that the law has been found defective in some respects, 862 surveys have been made and notices served on the owners of ditches to install suitable screens. At this date 518 screens have been reported as being installed and in effective working condition. Before May 15 of this year between fifty and sixty screens have been installed at the expense of several thousand dollars. For instance, the screens installed by the Sacramento-West Side Canal Company, the Anderson-Cottonwood Irrigation Company and the Southern California Edison Company, cost many thousands of dollars each.

The work of installing screens in ditches is being pushed as rapidly and as vigorously as conditions will permit.

Under the law as amended in 1917, at the suggestion of the commission, the California Oregon Power Company has, at an expense of $20,000, built a hatchery at the Copco dam on the Klamath River, and last month conveyed it to the state, together with dwellings, traps and other equipment necessary to operate the station.

12. Ladders. The present Fish and Game Commission in 1912 began a systematic survey in order to determine where fish ladders should be installed. As stated under the head of "Screens" (point 11), two men were detailed under the supervision of the Hatchery Superintendent to make these surveys and to draft plans to be given the owners or occupiers of the dam. Numerous ladders and screens were installed; under the law 47 hearings as to the necessity of the installation of screens and ladders were held by the commission and findings made and orders issued by the board compelling the installation of fishways and screens. To date a total of 209 surveys of dams have been made and the owners have been legally notified to install fish ladders in accordance with the plans submitted. Of this number 131 fishways have been constructed and have been accepted as being effective. The other cases are being pushed vigorously and in some instances actions have been commenced to compel obedience to the orders of the board.

13. At the 1917 session of the Legislature, the commission was instrumental in having sixteen large areas within national forests set aside as game refuges, aggregating 839,180 acres. Besides this, the commission has now established seven game refuges on privately owned land in sections where hunting is intensive and game needed such protection. Within the last six months, over 60,000 acres of private holdings have been set aside for this purpose.

The commission is now asking the Legislature that two new game refuges be created, one around Lick Observatory, the other in Kern County.

14. The branch office established at Fresno was abolished because the work done by that office could be more efficiently and economically handled by the San Francisco office. The officer who had been in charge of the Fresno office was retained in the service of the commission until he voluntarily asked to be given a furlough in order that he could operate a mine which he owned and also attend to his agricultural interests which demanded his attention.

15. The game farm at Hayward, California, was established in 1908, prior to the appointment of the present board. The grounds were leased for a period of ten years. This commission was willing to cancel the lease at any time, had it been able to make suitable terms with the owner. When the owner of the land sued the commission to

set aside the lease, the commission put in practically no defense, but Judge Murphy, who tried the case, nevertheless ordered the commission to maintain a game farm on the land until the expiration of the lease.

16. It is not true that the distribution of fish as carried on by the commission is unscientific, unduly expensive or that it results in the destruction in each year of a large portion of the fish so distributed.

Through the efforts of the commission, two fish cars, distributing fish all over the State of California, are hauled free of charge by the railroad. The greatest of care is taken to see that the fish are properly distributed and properly planted in the streams and lakes.

17. It is not true that the Fish and Game Commission failed to investigate the young salmon propagated and distributed in the Sacramento River. The Fish and Game Commission has heretofore caused such investigation to be carried on by Dr. C. H. Gilbert of the Stanford University and Mr. N. B. Scofield, fishery expert for the commission, and is now carrying on such investigation in conjunction with the Bureau of Fisheries under the direction of Mr. Willis Rich and Mr. J. O. Snyder of the Stanford University, Mr. N. B. Scofield and Mr. W. H. Shebley. Salmon fry are held longer at Mt. Shasta Hatchery and are larger when released than those reared by any other state or county.

18. The commission has not at any time been governed for political or personal or other inefficient or improper motives.

a. It has not dismissed trained or efficient employees without cause.

b. It has not employed or promoted or otherwise rewarded assistants or employees not deserving of such consideration.

c. The department is not demoralized or functioning inefficiently or at an expense out of all proportion to the results obtained. On the contrary, the work of the department is now being performed more efficiently, intelligently and economically than at any other time during its existence.

19. The force of wardens in the field is as great as the funds of the commission will permit. If the overhead has increased, it is caused by the increase of the clerical work connected with the commission's activities, and also by the rules and regulations laid down by the Board of Control.

Respectfully submitted.

FISH AND GAME COMMISSION.
CARL WESTERFELD, *Executive Officer.*

Fig 54. Yosemite Valley deer photographed in a snowstorm. Snow was falling at the rate of two inches an hour when these deer were photographed by A. M. Fairfield, March 8, 1919. Exposure 1/25 sec., stop, F 6.3.

CALIFORNIA FISH AND GAME

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All material for publication should be sent to H. C. Bryant, Museum of Vertebrate Zoology, Berkeley, Cal.

October 21, 1919.

PERSUASION VERSUS COMPULSION IN FISH AND GAME CONSERVATION.

Legislation is the time-honored method by which the body politic attempts to attain an object. When new roads are desired, the legislature is asked to enact the proper laws. When the public health is to be safeguarded, an act of the legislature is demanded. But beyond the mere placing of a law on the statute books is the necessity of making the law effective by means of law enforcement. Where the need for the laws is well realized there is little need of law enforcement; where they are poorly understood, time, energy and money must be spent to attain the object sought.

When, in fish and game conservation, we turn to this same time-honored method, the difficulties are just begun, for laws passed by the legislature must be enforced. Because of the failure of peace officers to do their duty, a large number of specially appointed game wardens must force people to obey the law.

Is there not a better way of attaining the same object? More and more we find campaigns of education being instituted to prepare the way for proper legislation. A city does not think of holding a bond election until after the people have been educated to the need for which the bonds are to be issued. Successful liberty loans have been effected by proper publicity almost to a greater extent than by the actual systematic canvass. The best example of accomplishment by means of an educational method rather than a legislative method is to be found in the success of the United States Food Administration.

How much better to have attained the goal by means of persuasion rather than compulsion!

If it is evident in attaining an object that the educational is of more worth than the legislative method because more fundamental, it seems reasonable that more time and energy should be devoted to this method in attempting the conservation of natural resources.

THE ANGLER VERSUS THE NET FISHERMAN.

The old controversy between the angler for sport only and the net fishermen for profit only, over the waters adjacent to Santa Catalina Island, has been revived recently.

It was thought that this matter had been definitely settled by action of the 1917 legislature in making two districts around the island, one in which net fishermen could operate and one for the benefit of the sportsmen only.

The promise of the cannery interests and net fishermen that they would not operate in a district dedicated to the sportsmen, provided a certain part of the waters surrounding the island be made a district in which net fishing should be permitted, would certainly seem to have settled the matter. However, it appears that this gentleman's agreement was not considered binding by some of the contracting parties.

About the middle of August, twenty-two canneries operating around San Pedro and some 340-odd alien fishermen who, not being able to maintain an action in the state court, cloaked themselves under the protecting wing of the canneries, obtained from the presiding judge of the Superior Court of Los Angeles County an order restraining certain individuals from interfering with their nets and boats, and further restraining them from making searches and seizures. This order was petitioned for under the plea that irreparable damage would be caused by the action of these certain named defendants, operating without due process of law.

The order was granted without previous notice to any of the defendants named in the petition. No mention was made in the petition that all of these

defendants were officers of the law, sworn to enforce the law, and that the actions complained of were performed in the pursuance of their duties.

The restraining order was served on H. B. Nidever, W. B. Sellmer and E. L. Heidderly, but no order was served at that time on the Fish and Game Commission. The order was also served on Ernest Windle, justice of the peace of Avalon township, Bates and Sutermeir, respectively deputy county warden and constable of Avalon township.

The hearing of the petition to make permanent the temporary injunction was held before Judge Valentine on August 19, 1919. The attorneys representing the plaintiffs in the action attacked the constitutionality of section 636 of the Penal Code, relating to nets, and also the description of District 20, as given in the act dividing the state into fish and game districts. They maintained that since the acts were void, the court had the right to restrain the public officers from enforcing the provisions of section 636. They also maintained that the state had no jurisdiction over the waters surrounding Santa Catalina Island, because the state constitution made no mention of a three-mile limit around the island. This latter contention was shown to be so absurd that it has since been abandoned.

The court took the stand that since a temporary order had been granted, it was up to the defendants to show cause why it should not be continued and made permanent. The defendants were given five days in which to present their opening briefs; the plaintiffs were given five additional days for reply, and the defendants were allowed five days further for their closing briefs. By this, it can be seen that the cannery interests gained fifteen additional days in which to make raids on the fishing grounds in District 20.

Immediately after the hearing, an order was served on the Fish and Game Commission restraining it from enforcing the law relating to net fishing in the waters around Catalina Island.

It is of interest to note, however, from the report of our deputies, that the fishermen have gained very little by their tactics, as their fishing operations have produced very poor results.

Judge Valentine having set aside the temporary restraining order September 10, 1919, the Fish and Game Commission has given instructions to its deputies to enforce the law in District 20. For the time being, it would seem that this decision in favor of the commission's contentions will effectually settle the controversy.—E. C. B.

Fig. 57. Children on a nature study field excursion, Al Tahoe, evidence of the success of the educational work carried on by the Fish and Game Commission in summer resorts this past summer.

EDUCATIONAL WORK IN SUMMER RESORTS.

The attempt to stimulate interest in wild life by carrying the Fish and Game Commission's educational campaign into the summer resorts proved very successful. During the month of July Doctor Bryant visited five of the largest resorts on Lake Tahoe: Brockway, Tahoe Tavern, Emerald Bay Camp, Al Tahoe Inn and Fallen Leaf Lodge. Lectures illustrated with stereopticon and motion pictures were given in the evening and parties taken afield in the day time. Of particular interest were the groups o children who roamed the woods an stream sides searching for wild things It would be difficult to estimate the valu of these excursions when the public a leisure came in contact with nature and learned the fundamentals of conservation first hand.

The final report shows that thousands of people were reached through the medium of lectures and that hundreds received instruction from a nature guide. The nature study reference books furnished by the California Nature Study League were in great demand and greatly helped in awakening interest in wild things.

It will be of interest to our readers to know that the Department of the Interior has decided to employ in each national park a resident naturalist whose duty it will be to answer questions and to interest people in the out-of-doors. Thus will the government augment the work already started by the commission.

The summer resort work at Tahoe proved so popular that an expansion of the work another summer will be demanded. There is no surer way of stimulating interest in wild life conservation than to develop interest in the out-of-doors when people are most susceptible to information about it.

Fig. 58. "Learning to read a roadside" at Emerald Bay under the instruction of a nature guide furnished by the Fish and Game Commission. An experiment in making conservationists out of the summer vacationists.

TAHOE PUBLIC CAMP.

The legislature at its last session set aside the old hatchery grounds at Tahoe City, which are to be abandoned for a better site, as a public camp for vacationists. Under the direction of the Fish and Game Commission the State Engineering Department installed a water supply, sewer system and other sanitary conveniences. The camp was opened to the public on July 4 with Mr. Arnold D. Patterson as superintendent. On the first day over a hundred campers were cared

for. The camp remained open until September 5. During the season 1,289 persons registered, but this number does not represent the total number accommodated. Further improvements are to be made in preparation for the crowds expected next summer.

and providing for a bag limit of one deer. Governor Smith, in signing the bill, stated that the law was in the nature of an experiment and that if it proved unsatisfactory it would be repealed.

Laws of this character, contrary to recommendations of those most interested

Fig. 39. Tahoe Public Camp on the old hatchery grounds at Tahoe City. Hundreds of campers availed themselves of the comforts of this free camp ground conducted by the Fish and Game Commission. Photograph by George Neale.

DEER CONSERVATION IN NEW YORK.

The state of New York is gaining some valuable facts by obtaining a census of the deer. The reports lead to a conclusion that there are in round numbers about 50,000 deer in that state. In 1917, approximately 37,000 men hunted deer and the total deer killed is estimated at 10,000. Records show that 5,888 Adirondack deer hides were received for tanning by different tanning companies.

Approximately 19,000 of the total number of deer are bucks. With a kill of 10,000 about 50 per cent of the bucks are killed each year. This is a toll already too great if the deer supply is to be maintained.

As a result of investigations a shorter season and a bag limit of one buck instead of two was recommended, but the legislature, influenced by selfish hunters, passed a bill allowing the killing of "any wild deer of either sex, other than fawns."

in game conservation and contrary to the best experience of other states, are likely to prove costly experiments.

MIGRATORY BIRD TREATY ACT CONSTITUTIONAL.

The duck shooters of the country who have fought federal protection for migratory birds in an effort to defeat the law so that they might continue the destructive practice of spring shooting of waterfowl, have been decisively beaten on two occasions lately in the United States District Courts. This fact is made more interesting because on both occasions those opposing the law felt certain they would win. Their array of counsel was the best they could obtain. They chose their cases with due regard to decisions made in the past and with all respect to the local sentiment in the district where the trial was held. In fact, they left no stone unturned that would aid them in their fight to defeat the law, and still they

lost. The sportsmen of the country should feel highly pleased over their victory, for surely the law is valid or the organized fight against it would have met with at least some slight success.

On June 4, 1919 United States District Judge Jacob Trieber, of the Eastern District of Arkansas, who held that the original migratory bird law of 1913 was unconstitutional, handed down a very sweeping decision upholding the new law. This was the first jolt received by the spring shooters, but the knockout blow came later at Kansas City, Missouri, when Judge Arba S. Van Valkenburgh, on July 2, 1919, upheld the law in a decision so sweeping that a fitting comparison is Dempsey's decision over Willard a few days later.—*Bull. American Game Protective Association.*

WATERFOWL DIE FROM EATING SHOT.

Wild ducks and other waterfowl sometimes die from lead poisoning resulting from swallowing stray shot which they pick out of the mud about shooting grounds. Many ducks that become sick from lead poisoning finally recover, but it is probable that the effect is permanently injurious not only to the individual but to the species. It has been ascertained by experiment that lead greatly impairs the virility of male domestic fowls. Females mated with them lay many infertile eggs, while in many of the eggs that are fertilized the embryo dies in the shell or the chick emerges weak and unable to withstand the hardships of early life. What effect lead poisoning has on female wild fowl has not been definitely ascertained, but, as the fact is well known that lead produces abortion in female mammals, there is a possibility that it exerts a bad effect on female waterfowl during the breeding season. Thus, the supply of waterfowl is likely to be decreased by lead poisoning not only by the number of birds that die directly from it but indirectly by impairment of reproduction.

These facts are set forth by the United States Department of Agriculture in Bulletin 793, "Lead Poisoning in Waterfowl," about to be published as a contribution from the Bureau of Biological Survey. Reports of waterfowl apparently sick from lead poisoning have been coming in for several years. The Biological Survey undertook an investigation at various shooting grounds to determine how common the taking of shot by waterfowl is, and a series of experiments to ascertain the effect of shot swallowed. It was found that at places where much shooting is regularly done from blinds, shot at the bottom of the shallow water are so numerous that one or more was found in practically every sieveful of mud or silt, and that they are swallowed by waterfowl whenever found as a result of this habit of swallowing small, hard objects to supply grit for the gizzard.

The experiments have shown that shot swallowed are gradually ground away in the gizzard and pass into the intestines, producing a poisoning that results in progressive paralysis and, usually, death. Experiments with wild waterfowl captured when young and reared in captivity—to obviate the possibility of their having taken lead before the beginning of the experiments—have shown that six pellets of No. 6 shot constitute an amount of lead that is always fatal. Two or three shot were sufficient to cause death in several instances. In one experiment, two mallards were given one No. 6 shot each. One of them died in nine days and the other was able to throw off the poison.

The list of species known to have been poisoned by eating shot consists of mallard, pintail and canvas-back ducks, the whistling swan, and the marbled godwit, but many other species, particularly of ducks and geese, are undoubtedly affected by it, according to the bulletin.

Unfortunately, nothing can be done at this time to protect waterfowl from lead poisoning except to call attention to the malady and to make known its cause and symptoms. The department, however, desires statistics on the numbers and species of birds affected and asks that sportsmen and others report to the Bureau of Biological Survey all cases that come to their attention.

GOVERNMENT NEEDS DEPUTY CHIEF GAME WARDEN.

The United States Department of Agriculture is in need of a well-qualified man, not less than twenty-five nor more than forty-five years of age, to fill a vacancy in the position of deputy chief United States game warden, and the United

States Civil Service Commission will give a most practical open competitive test to secure the right man. The entrance salary will be between $2,500 and $3,000 a year. Headquarters will be in Washington, D. C.

The duties of the position are to assist in administering the law which gives effect to the treaty between the United States and Great Britain for the protection of migratory birds and the sections of the United States Penal Code known as the Lacey act; in the supervision of United States game wardens and deputies in the gathering of evidence and the preparation of cases for prosecution of alleged violations of the federal game laws, and in office administration; and to participate in conferences in and out of Washington with individuals and organizations interested in wild life conservation.

In accordance with its practice in connection with positions of this class, the examination given by the Civil Service Commission will not require the applicants to appear in an examination room for a mental test. Those who apply will receive a rating on their education and practical experience, weighted at 80 per cent, and on a thesis on a selected game-conservation subject, weighted at 20 per cent. Those who attain a passing grade will later be given an oral test to determine their personal qualifications for the position. Failure in this oral test will render the applicant ineligible for appointment.

Applications will be received by the Civil Service Commission up to and including October 28. Full information and application blanks may be obtained from the secretary of the local board of civil service examiners at the post office or customhouse in any of 3,000 cities, or by writing to the United States Civil Service Commission, Washington, D. C.

ANGLERS, ATTENTION.

At last we have landed the articles on angling you have been looking for. All of the fine points of angling will be discussed. Read the first of the series which treats of dry-fly fishing on page 169 of this issue and watch for the other articles in the series furnished by "R. L. M., California," than whom there is no better writer on the subject.

ADDITIONAL MIGRATORY BIRD TREATIES NEEDED.

In order to complete our program for the protection of migratory birds, it is as necessary for them to be protected in the countries in which they sojourn during winter months as in the territory where they breed and spend their time in spring, summer and autumn.

It is therefore imperative that treaties be entered into with the republics of Mexico, Central and South America for the protection of birds that, in the course of their annual migration, pass from or through the United States and temporarily sojourn in such countries. It is a startling fact that wild duck are slaughtered by the millions in Mexico by pothunters, many of whom use masked batteries, and that they are sold in the markets for the pitiful sum of three cents each.

It is regrettable that the republics lying to the south of the United States have no game laws, but in the event those countries enter into treaties with the United States government for the protection of migratory birds, in order to carry out the terms of such treaties, such countries will be required to enact and to enforce laws making such treaties effective.

A campaign of education should be at once inaugurated in the Latin-American republics for the purpose of bringing to the attention of the people the economic value of birds and game, and the relation of these resources to the comfort, happiness and recreation of man.

The question is, can the migratory wild life withstand the onslaughts made upon it for mercenary purposes by irresponsible individuals in the Latin American republics, without being subjected to certain depletion and ultimate extinction?

Should the sportsmen of the country concur in the views briefly set out in this short paper, let them bestir themselves by addressing communications to their members of congress, and urging their active influence and assistance in making the treaties between the United States and the Latin-American republics, for the protection of migratory birds, an accomplished fact.—JOHN H. WALLACE, Commissioner, Dept. Game and Fish, Montgomery, Alabama.

STATE FAIR EXHIBIT.

The Fish and Game Commission's exhibit at the State Fair at Sacramento, August 30 to September 9, 1919, was the most pretentious yet attempted and proved to be the biggest attraction at the fair. A capable engineer was retained to draw the plans and Mr. Wm. F. Dabelstein, an artist of San Francisco, executed them. The whole north end of the new Agriculture Building was given over to the exhibit. The main feature of the exhibit was a cyclorama of the Sierras with Mounts Shasta, Lassen and Whitney looming up in the background and in the foreground the south end of Lake Tahoe

Fig. 6. The Fish and Game Commission's exhibit at the State Fair at Sacramento which took the form of a panorama of the High Sierras with Mount Shasta and Lake Tahoe at the left and Mount Whitney with a miniature of the Mount Whitney Hatchery at its base at the right. The exhibit was pronounced the finest on the fair grounds.

at one end and a miniature of the Mount Whitney Hatchery at the other. Several miniature waterfalls tumbled down the rocks into an artificial lake filled with trout. The whole scene was made still more attractive by a system of lighting which successively showed the gray light of dawn, the rosy tints of sunrise and the light of full day.

Arranged in front of the panorama were four large aquaria. Two of them showed common introduced fish such as black and striped bass, blue-gilled sunfish, crappie and catfish, a third showed different varieties of trout and a fourth was filled with the famous golden trout of the Mount Whitney region. Great interest was shown in the golden trout, and no wonder, for their bright colors would attract anyone. The hardiness of this variety of trout was evidenced by their vigorous good health while in the aquarium. Not a fish was lost in transit, nor did one die during the ten days duration of the fair. The publications of the commission were on display and wild life films were shown in the motion picture theater twice daily.

GAME CENSUSES.

Many states are inaugurating a game census to determine the distribution and comparative abundance of different varieties. New York requires the wardens to report regularly on all game seen and also requires a report of the game taken, from each license holder. Minnesota has just inaugurated a similar census to be made by wardens. Although such censuses will doubtless give a basis for estimating the abundance of game, yet such reports are necessarily so inaccurate that California has not instituted similar work. It may be that at some future date California will follow the lead of these other states.

In the meantime J. S. Hunter, assistant executive officer, is contemplating a different sort of a census—one which would perhaps bring in more dependable data with less work. The number of cartridges sold in the state, if it were

Fig. 61. Posting a game refuge. Suitable signs now mark the boundaries of our refuges. Photograph by H. C. Bryant.

known, would allow an estimate of the game killed. Different sorts of cartridges are used for the different kinds of game birds and mammals and with due allowance for game missed the total kill could be approximated. The securing of data along these lines would not be as difficult as the requiring of reports from wardens and hunters.

HATCHERY DEPARTMENT MOVES.

The Fishcultural Department, headed by Mr. W. H. Shebley, has moved to Sacramento, where temporary offices have been established in the Forum Building pending the more commodious quarters being prepared in the new Capitol Building. All correspondence connected with the Hatchery Department should hereafter be addressed to Fish and Game Commission, Department of Fishculture, Forum Building, Sacramento.

COLORED PRINTS OF GOLDEN TROUT AVAILABLE.

A few copies of the beautiful lithograph of the golden trout which appeared as the frontispiece of the Trout Number of CALIFORNIA FISH AND GAME are available for distribution. Libraries and schools are urged to procure copies for framing. Send a two-cent stamp.

FACTS OF CURRENT INTEREST.

A number of aliens who have purchased citizens' hunting licenses have found that it does not pay. In each instance they have had their license confiscated and been made to pay a $50 fine.

Splendid fish have been reared at the Yosemite and Kaweah experimental hatcheries, thus demonstrating the feasibility of constructing permanent hatcheries at these stations.

State lion hunter J. Bruce recently succeeded in bagging four lions in Tuolumne County.

Plans are under way for a State Fisheries Laboratory to be located near San Pedro. This will furnish working quarters for the scientific staff of the Department of Commercial Fisheries and will give room for an educational exhibit showing the work of the department.

Nearly three-quarters of a million golden trout were successfully reared at the hatcheries this year. Most of them will be planted in the Southern High Sierras, but some will be placed in the Tahoe region.

So great was the demand for the Trout Number of CALIFORNIA FISH AND GAME with its colored plates that the supply is practically exhausted.

Hundreds of campers availed themselves of the public camp on the hatchery grounds near Tahoe City this past summer. It will be remembered that several acres of land were set aside for campers by the last legislature.

Several additional wardens have been employed this past summer to help patrol the state game refuges. Added protection has also been accorded by the eight aeroplane patrols established by the United States Forest Service.

Ducks are again dying from alkali poisoning in the Marysville Butte region of the Sacramento Valley.

COMMERCIAL FISHERY NOTES.

N. B. Scofield, Editor.

THE SALMON OF THE SACRAMENTO NEED MORE PROTECTION.

It is believed that the Sacramento salmon are not being adequately protected and that serious depletion may now be taking place. Within the last few years the salmon fisheries at Monterey and Point Reyes, which draw upon the Sacramento supply, have grown enormously, and as they have grown the catch on the Sacramento has been correspondingly less, in spite of the fact that the number of nets on the river has increased and that on account of the higher price the fishermen fish more persistently.

The present fall season on the Sacramento remains open at least two weeks too long. Several years ago the season closed on September 16. It was contended by fishermen and dealers that the salmon were running later each year and they succeeded in obtaining an open season until September 20. Later the season was continued until September 25. The object of the closed season is to protect at least one-third of the run in order that they may pass up the river unhindered by nets and cast their spawn in the headwaters and by so doing insure a continuous future supply of salmon. With the present season, one-third of the run is not protected, for by the closing date, September 25, the last of the run or so much of it as is left has passed the nets in San Francisco Bay, San Pablo Bay, Carquinez Straits and Suisun Bay, a distance, favorable for the use of nets, of nearly fifty miles. The salmon work up the bays and river slowly and after the run has passed the lower bays the fishermen move up and continue to catch them in the lower river until the season finally closes. The wonder is that any escape. The salmon which have escaped make their way to the spawning grounds which are located mainly in the tributaries, Mill Creek, Battle Creek and McCloud River. In each of these tributaries a spawn-taking station is operated to collect salmon eggs for the hatcheries. The number of salmon reaching these stations is becoming less each year so that the number of eggs that may be taken is now only about one-fifth what it was only a few years ago. This decrease in the number of fish reaching the spawning grounds is a sure sign of overfishing and it is self evident the salmon should be protected from this overfishing.

The Sacramento also has a spring run of salmon or rather what is left of a once large spring run. The salmon of this run enter San Francisco Bay during the winter and early spring and after escaping the trollers outside they have to run the gauntlet of gill nets through the bays and the river as far up as Colusa. Above Colusa, as far as Vina, every place the river sweeps round a bend with a sandbar on the inside of the turn there is a seining outfit which periodically sweeps the deep hole where the salmon congregate preparatory to ascending the next shallow stretch of the river. There are some fifteen of these outfits operating on the "seining bars" on the upper river. And the salmon can not escape these seines which sweep the holes where they collect except during periods of very high water. On the river below Colusa and in the bays, there is no closed season to protect this spring run. On the river above Colusa the season closes May 15, but this date is so late the run is all but over.

There is no salmon stream in North America where nets are allowed for so great a distance up the stream as on the Sacramento. The number of salmon taken in these seines is not great, but they are the remnant of the spring run and they are a thousand times more valuable for propagating the species than for food. The hatchery of the United States Bureau of Fisheries at Baird on the McCloud River is the only hatchery which has collected spawn from the spring salmon run, but at this hatchery they have not attempted to take eggs from this run for the past six years for the reason the number of salmon reaching that point had become so small it was deemed insufficient to warrant the expense of operating.

Two things are quite obvious to anyone who knows the facts. Seining and gill netting in the upper river should be pro-

hibited and the fall season should close earlier so as to give some measure of protection to the larger and more important fall run. Trolling in the open sea possibly should be restricted. Investigations which were begun this year by the Fish and Game Commission under the direction of Dr. J. O. Snyder are expected to throw light on this point.

STRIPED BASS TAKEN IN MISSION BAY, SAN DIEGO COUNTY, CALIFORNIA.

Mr. A. G. Pearson of San Diego reports that on or about June 20, 1919, he took several small striped bass ranging from five to eight inches in length, in San Diego River near its outlet into Mission Bay.

On October 26, 1916, eighteen hundred small striped bass were planted near the mouth of San Diego River by the Fish and Game Commission, and since that time small striped bass have on several occasions been observed near the place of planting. As far as is known, only the one plant has been made in southern California and striped bass have never before been reported south of Monterey Bay. The fry at the time of planting were between two and three inches long, being fish of the year, spawned in April or May, 1916. If these fry had grown at the rate they do in San Francisco Bay they would have reached the size of five to eight inches in 1917, during their second year. If the fry reported by Mr. Pearson are some of the fry liberated in 1916 they are in their fourth year and their rate of growth has been remarkably slow. It is suggested that these five- to eight-inch fish are the progeny of the fish planted in 1916, but that can hardly be as a sufficient length of time has not elapsed, for it is pretty certain that striped bass do not spawn earlier than their fourth year and the fish planted in 1916 would not complete their fourth year until the spring of 1920. It would seem more probable that striped bass plants have been made of which we have no record or else striped bass which are plentiful in Monterey Bay have strayed to the south and occasionally spawn as far south as San Diego.

The striped bass is not native to the Pacific coast, but was introduced from the Atlantic coast in the early seventies and since that time has become quite plentiful.

KELP HARVESTING MAY BE RESUMED.

During the period of the war nearly four thousand tons of kelp were harvested each year in California waters. Upon the signing of the armistice practically all harvesting ceased as potash could not be extracted from the kelp economically enough to compete with the foreign potash which it was expected would be imported again in large quantities. In extracting potash from kelp many by-products were obtained which had never before been obtained in commercial quantities. As yet most of these by-products have not found a market. Much progress was made in developing more economical methods of obtaining the potash from kelp and it was hoped that if a market could be found for the by-products the kelp plants could continue to operate, but the armistice came sooner than expected and the plants closed down. Since then efforts have been made to place a duty on foreign potash, but as yet congress has taken no definite action. Efforts have also been made to find markets for the by-products and now one or more new companies which believe they have found the solution expect to resume the harvesting of kelp. The future of the industry will depend less on the value of the potash extracted than on the other chemicals which should be valuable when commercial uses for them can be found.

SARDINE RUN AT MONTEREY.

The sardine season at Monterey has been earlier than that usually considered normal. Canneries were running full capacity during July and August. During August the run was exceptionally large and the fish unusually firm and of good quality. This year there were more crews fishing sardines than ever before, forty-five crews operating, or an increase of seven crews over last year. The shortage of cans during the fruit season greatly curtailed the size of the sardine pack, which otherwise bid fair to break all records for this locality.

STEELHEAD.

It is often said by sportsmen that steelhead trout do not take the hook in open salt water. As contrary evidence a 3½-pound (cleaned weight) steelhead was caught July 23, 1919, on the hook in the open Monterey Bay and the local fishermen claim that such a catch is no great rarity. Several steelhead were also taken this year on the Mendocino County coast by the same method while fishing for salmon. During the summer of 1910 many steelhead were taken, during a period of six weeks, by trolling off Soquel in Monterey Bay. Many of the trout were caught a mile off shore.

SEAWEED AS FOOD.

The Chinese consider some of our seaweeds a very desirable basis for soups and several Monterey Chinamen make a business of catering to this demand. The weed is sun-dried and sacked, but held in the sack for further drying before shipment. During the last five months about 1,450 pounds, dry weight, have been shipped to such eastern points as Chicago, Cleveland, San Antonio and Newark.

SALMON AT MONTEREY.

The king salmon season just closed at Monterey resulted in one-half the normal season catch. The early run was not caught heavily because of a fishermen's strike and the late season run was light and ended early. The run of silver-side salmon was also light, but extended over a longer period than is usually credited to this fish. The silver salmon is said to suddenly appear in Monterey Bay, run heavily for a few days and suddenly disappear, but notes kept on the 1919 season show them as caught in small numbers between May 10 and July 26, with a heavy catch on four or five days during the period.

DRY SALTING FISH AT MONTEREY.

There are at present twelve firms engaged in the business of hard or dry salting fish at Monterey, representing an approximate investment of $50,000. One firm has invested $7,000 in equipment since last year. In addition, there are eight fresh-fish dealers who do considerable dry salting during otherwise slack periods. Several firms that operated last year have not yet opened up for business, September and October being the big months in the hard salting industry. The chief product is sardines in the form of salachini pressed into round 100, 65 and 50 pound tubs. Anchovies are usually put up in 5, 8 and 10 pound cans although some anchovy and sardine paste is made. Mackerel is salted in 200-pound barrels.

As yet the trade will not take any great quantity of these relatively new products on this coast, but the hard salt business promises to develop into a well established and increasingly large industry in the future.

SQUID AT MONTEREY.

This year for the first time in several years squid have been caught in quantity at Monterey. Three Chinese firms have dried this season about 1,772,000 pounds (fresh weight) of squid. Three tons of wet squid furnish one ton dried. Due to high labor cost this year the squid were not cleaned, merely dried on the ground, raked up and sacked. Fishermen were paid $10 per ton for the catch and the dried product sacked ready for shipment is valued at 6 to 7 cents per pound. Practically all this sacked product is shipped to China.

In addition, small quantities of squid have been canned in half pound rounds. The appreciation of fresh squid as a table delicacy is slowly growing, but people who delight in oysters and eels usually balk at squid tentacles till they have tried them once.

DO FISHERMEN GO FAR ENOUGH TO SEA TO GET THE FISH?

It is the belief of some of the canners of southern California that such pelagic fish as the tunas and albacores may be found in large numbers farther off shore than the fishermen usually fish. As the tuna canning industry has grown the fishermen have been getting larger boats and are fishing, during the latter part of the season, twenty to thirty miles off shore. Incoming ships have observed what they have taken to be schools of long finned tuna ("albacore") some two hundred miles off shore. To determine if

these fish are abundant at this distance off shore the Fish and Game Commission's launch "Albacore" was detailed to make an investigation and succeeded in finding albacore in abundance near San Nicholas or about eighty miles off the mainland. If these fish can be found in numbers at a greater distance off shore, larger fishing boats will be built and preparations made to fish farther at sea when tuna are not to be found closer to shore.

LARGE SALMON CATCH AT FORT BRAGG

While the salmon catch this summer at Monterey was only half the usual amount the catch of salmon by trolling has been exceptionally large in the vicinity of Point Reyes in Marin County and near Fort Bragg and Shelter Cove on the northern California coast. The data has not yet been compiled, but it is believed the catch at Point Reyes as well as the catch near Fort Bragg has been double that of last year.

THE SACRAMENTO RUN OF SALMON.

After the opening of the season on the Sacramento River August 1, salmon ran in small numbers until August 28, when the fishermen began to get large catches in their gill nets and everything indicated that what is termed the "fall run" was on. The fish appeared to be larger than average and several very large individuals have been recorded. One was landed at the plant of the Western Fish Company at Pittsburg which exceeded seventy pounds in weight. No scales were taken from this salmon in order that its age might be determined, but judging from other large individuals whose age was determined from an examination of their scales it was not less than seven years old.

The appearance of the salmon being delivered at Pittsburg early in September would indicate that they would spawn early this year. They had more the appearance of fish which run three weeks later and it was argued by the fish dealers that the salmon run would end much sooner than usual.

Fig. 60. Looking down the Noyo River from the boat harbor at Noyo, California. This is the center of the salmon fishing industry of the north coast. Westcoates photo.

Fig. 63. Scene on Noyo River showing salmon fishing boats. Wonacotes photo.

NOTES FROM THE STATE FISHERIES LABORATORY.*

By Will F. Thompson and Elmer Higgins.

THE RECURRENCE OF THE FRIGATE MACKEREL.

In California Fish and Game for October, 1918 (Volume 4, Number 4, page 183), the first occurrence of the frigate mackerel, *Auxis thazard*, was noted. This was one of the remarkable features of the unusual summer season of 1918. At that time small catches were made in company with catches of skipjack (*Euthynnus*), yellow-fin tuna and some mackerel (*Scomber*). This year slightly larger individual boat catches were made of the frigate mackerel, but as the majority of the canneries refused them, they were not brought in as often. One catch of five tons was recorded by a single boat on the nineteenth of August. The first noted by the writer came in on the seventeenth of August, and the last on the twenty-second. Other catches at earlier and later dates were undoubtedly made, but the data have not yet been obtained from the statistical records. The average weight of these fish was 1.3 pounds before cleaning, and the loss of weight in cleaning and preparing for canning was very high. Therefore those canneries which accepted the species at the start of the run later refused to take any except for fertilizer.

It may be noted in connection with this species that mention of very young tuna or albacore may refer to the taking or observation of schools of the frigate mackerel. Fishermen unfamiliar with them, as was usually the case, were inclined to promptly refer them to the young of other species of the tuna group, frequently the blue-fin.—W. F. T.

*California State Fisheries Laboratory, Contribution No. 12.

THE SPAWNING OF THE GRUNION.

In Fish Bulletin No. 3, relating to the spawning of *Leuresthes tenuis*, the grunion, there is given on page 14 a chart showing the relation of the tides to the spawning times. As the paper was published on July 15, before the spawning season was over, no spawning periods were shown in July and August. However, since then, runs were observed on July 15, July 16 and August 14.

The runs on July 15 and 16 were small, but larger than that on August 14. The full moon occurred July 13 and August 11 (Greenwich mean civil time). Mr. Henry Shands, a field assistant for the laboratory, observed the run during July in the absence of the writer, and states that it was noticed by a considerable number of people, who remained on the beach to collect the fish. The run during August was observed by the writer, but so few fish were noticed that it seemed an accident to have taken them at all. Hence, although the fish were obtained on but one night, this fact does not mean that grunion did not run the usual three nights. No people were observed on the beach capturing the fish, this fact corroborating the observed small size of the run.

It will be noted, from the above-mentioned chart, that August 14 was the last date on which the grunion might be expected to run during the year 1919.—W. F. T.

CONTRIBUTIONS TO CANADIAN BIOLOGY.

Among additions to the library is a series of publications from the Canadian Biological Stations,* being studies made under the direction of the Biological Board of Canada, Professor E. E. Prince, Commissioner of Fisheries, Chairman. Included with them is a volume devoted to the Canadian Fisheries Expedition (Department of the Naval Service 1919), during which material was gathered for studies of the Canadian herring, the eggs and larvæ of the eastern coast of Canada, the hydrography of the region, etc., by Dr. Johan Hjort, and various associates. The publications are noteworthy, aside from the undoubted merit of the contributions, in that throughout many recent numbers there is an attempt to apply to American species the technique developed during the study of European fisheries by the International Council for the Study of the Sea.

The volume published under the direction of Dr. Johan Hjort includes in its covers two papers which are in good part general in character, dealing with the principles of the Norwegian work on the life history of the herring and of hydrographic work, the former by Einar Lea and the latter by J. W. Sandstrom. These papers will well repay the perusal both of the beginner and of the investigator, especially in the absence of general works dealing with the subjects.—W. F. T.

*Contributions to Canadian Biology, Supplements to the Annual Reports of the Department of Marine and Fisheries, Fisheries Branch, Ottawa, Canada.

BLUE-FIN AND YELLOW-FIN TUNA.

The catch of blue-fin tuna during 1919 was largely the work of purse seine boats, operating during the last part of the season in the northern waters around Santa Cruz Island. However, during the height of the run off Catalina Island, the schools invaded the prohibited waters of District 20. The statistics of the catch obtained during the subsequent weeks do not, therefore, give an accurate idea of the *abundance* of the fish because of the attempts of the seiners to evade the law, and the issuance of an injunction (August 13) against deputies seeking to enforce it. They are accurate, of course, in regard to the quantity taken.

A potential source of more serious error in statistics arose during the last part of August in the confusion by the weighers of yellow-fin with blue-fin tuna. The albacore boats began, about the twenty-fifth of August, to bring in numbers of large yellow-fin tuna (*Germo macropterus*), landing them at the canneries, in company with many smaller tuna. A close examination of these fish throughout the period of their run, which was not over on September 2, proved these fish to be usually of the one species, the "yellow-fin" tuna. It will be, in fact, a safe procedure to call nearly all tuna caught by albacore boats (other than combination net boats, which were not operating) during this period this species, in contradistinction to the blue-fin tuna

landed by the purse seine boats. But that even this leaves a certain error is undeniable, numbers of blue-fin tuna being brought in.

This is, incidentally, the first year in which these large yellow-fin tuna have been taken in this quantity in these waters. Last year the yellow-fin tuna taken were small, always under 30 pounds, while this year 75-pound fish (cleaned) were not rare, and one of them weighed 175 pounds cleaned, and was 65 inches in length. In fact, the blue-fin, or leaping, tuna did not exceed the size of these fish. It was not to be wondered at that these large, magnificent fish were at once called leaping tuna, traditionally the largest of our species.

However, the writer has satisfied himself by careful examination of a considerable series of fish that confusion need arise but very rarely between the species. Careful measurements have been taken of the body and fin proportions and compared according to standard methods used by ichthyologists in distinguishing species, but the more obvious characteristics may be reviewed here for the use of those who wish them, in view of the need for accuracy in statistics.

Color. The high fins above and below the fish (dorsal and anal fins) are usually tinged with yellow in the yellow-fin tuna, while they are as a rule dark in the blue-fin. The small finlets behind these are usually a brighter yellow in the yellow-fin.

The lower side of the body in both species bears characteristic markings, especially in the young. In the yellow-fin the marks tend to arrange themselves in alternate narrow transverse lines and rows of spots, and are smaller than those of the blue-fin, in which the spots are generally in transverse rows without intervening lines. In both species these spots become lengthened toward the tail. When freshly caught the yellow-fin, the young especially, has a strong lemon yellow tinge over most of the body, which is lacking in the blue-fin.

Pectoral fin. The length of the long side fin is the most obvious and reliable character by which the species can be distinguished, but very rarely a yellow-fin is found with a short fin. In the yellow-fin this side fin is almost always slightly shorter than the head, measured from the tip of the snout, and is not less than five-sixths of its length. In the blue-fin, this side fin is always less than two-thirds of the head length, and usually but three-fifths.

Head. The yellow-fin tuna has, as a rule, but not invariably, a shorter head than the blue-fin has.

Trunk of the body. The yellow-fin has a very noticeably shorter trunk than the blue-fin, if the "trunk" is considered the length before the two fins situated above and below the body. This holds only when fish of a size are compared and very large fish are likely to be hard to distinguish. The posterior part of the body where the finlets are is nevertheless more drawn out in the yellow-fin in comparison with the rest of the fish. Up to a certain length the fish seems to grow faster posteriorly, the young yellow-fin of 25 inches in length being similar in this characteristic to blue-fin of 45 inches.

Height of fins. The height of the two fins, one above and one below the body (dorsal and anal), differ markedly in the two species, but only when specimens of a size are compared. Yellow-fin tuna have higher fins (or longer, according to the way they are considered) but a yellow-fin of 30 inches in length has fins about as long in proportion as a blue-fin of 45 or 50 inches, although those of a 45-inch yellow-fin exceed the length of those of the blue-fin by a fourth of their length.

The eye. The eyes in the blue-fin tuna are actually nearly equal to those in yellow-fins of the same size, but because of the larger head in the blue-fin, they appear much smaller. The diameter of the eye in the blue-fin averages 3.2 per cent of the length of the body, and is about one-ninth of the head length, whereas that of the yellow-fin is 3.2 per cent of the body length, but about one eighth of the head length.—W. F. T.

THE OCCURRENCE OF THE LOUVAR.

On August 6, a large fish was brought into the canneries at Fish Harbor, San Pedro, from the west end of Catalina Island, and excited much comment as a probable hybrid between a pompano and a yellowtail. This proved far from the truth, however, the specimen in reality being a member of the "wide-ranging"

species *Lutarius imperialis* Rafinesque, once previously recorded from Catalina Island by Jordan & Starks in 1905 (as taken by Dr. C. F. Holder). It was an exceedingly active fish and very difficult to handle, although the small mouth and fine bristle-like teeth do not indicate predaceous habits.—W. F. T.

THE ABSENCE OF THE DOLPHIN FISH.

In 1918 the dolphin fish, *Coryphæna*, was frequently taken in local waters, and this fact was then often cited as evidence of a bad year for the fishing of albacore. However, this year the dolphin has not yet been in evidence (September 15), as far as we are able to determine, although the albacore season is far from normal. Indeed, the similarity between 1918 and 1919 is marked, the skipjacks (*Euthynus*) having been running in quantity as they did last year, the frigate mackerel having appeared again, and the year being remarkable as before for the predominance of the tunas.—W. F. T.

TWO RARE FISHES.

To the lists of fish, new or rare in southern California waters, previously published may be added two species which came to the laboratory in June.

Four specimens of the pomfret, *Brama raii* (Bloch), were taken from a gill net near San Pedro by Mr. E. M. Nielson. The pomfret is an excellent food fish found in open seas, widely distributed, but taken only occasionally on our eastern or western coasts or in Europe.

Several specimens of *Cololabis saira* (Brevoort) were sent to us from San Diego by Mr. P. B. Clark, where they were taken along with a school of sardines in a round-haul net. The species is recorded from several localities on our California coast but is said to be very rare. This same species is occasionally found in large schools in Japan.—E. H.

THE "DAY" AND "NIGHT" SURF-FISHES OF NORTHERN CALIFORNIA.

Captain A. C. Tibbetts of Eureka, California, writes to the undersigned as follows:

" * * * state that the 'grunion' is the fish known here as the 'night surf-fish.' There is another known as the 'day surf-fish,' both varieties being caught in dip nets, in the same locality, viz, between Trinidad and Mad River. The Indians catch and dry these in large quantities. The 'day-fish' is larger than the 'night-fish,' has a yellowish tinge, the flesh is softer, and to my taste is inferior to the 'night-fish.' On the ninth instant (of August) I saw both kinds on sale at one of the Eureka markets. Small coasters running to the Klamath River bring occasionally to this place what is termed 'candle-fish.' These, even when salted and smoked, burn freely if a lighted match is applied to the tail. The Klamath River, as far as I know, is the only stream near here that furnishes this fish. All three of the above fishes have the appearance of smelt."

One of these species is *Thaleichthys pacificus*, the eulachon or candle fish; another is probably *Hypomesus pretiosus*, the surf-smelt, but we are not at all sure that the third is the grunion, *Leuresthes tenuis*. Both *Mallotus villosus*, the capelin, and *Leuresthes tenuis* are surf spawners and might possibly occur, and as the latter has not as yet been recorded north of Long Beach, considerable caution should be used in reaching a decision.—W. F. T.

THE OCCURRENCE OF THE ALBACORE NORTH OF SAN FRANCISCO.

Captain A. C. Tibbetts has also informed us that on September 22, 1884, he captured three albacore off the northern coast of California. His letter reads in part as follows:

"While in command of the schooner 'Volant,' I was coming from the westward, bound for Humboldt Bay, and instead of getting northerly winds as expected at this time of year, the wind came in fresh from the southward, increasing to a strong southeaster as we approached the coast, resulting in our closing with the land to northward as well as to leeward of our port. The wind after some hours moderated, and changed to light northwest. While running for Humboldt Bar, at four to five knots speed, somewhere between Redding Rock and Trinidad Head, I noticed fish working the same as they sometimes do on the coast of southern California, and out of curiosity threw a cod line with a white rag on the hook over the stern, and when the line straightened out got an albacore. Caught three, as fast as they could be unhooked and the line put out again. The fish appeared to be abundant, but those taken were dirtying things up around the after part of the deck, so fishing was stopped."

Captain Tibbetts is familiar with albacore, having taken them south of San Francisco. He believes the long southerly blow had reversed the usual coastal current and brought warmer water with it. Extracts from his log-book are given in his letter.

He also (October 17, 1883) records the occurrence of skipjacks (presumably *Euthynnus*) in considerable numbers 120 miles west of Trinidad, over what he thought to be a small uncharted area of shoal water, but in an area not now traveled to any extent.—W. F. T.

CONSERVATION IN OTHER STATES.

NEW YORK OPENS NEW HATCHERY.

The Conservation Commission of New York announces that the new fish hatchery at Dunkirk has been opened. This is the largest and most completely equipped of the twelve hatcheries maintained by New York and will be used largely for the propagation of the lake or greenback herring.

GAME REFUGES IN MINNESOTA.

Game refuges may be established without hearing in the state of Minnesota when all landowners concerned join in a petition. A public hearing is required otherwise. All state parks and state forest reserve lands are game refuges.

WASHINGTON FORMS STATE SPORTSMAN'S ASSOCIATION.

Washington sportsmen have formed an organization to further the interests of all the sportsmen of that state. The object is to assist in the propagation and protection of game animals, birds and fish, to influence legislation toward this end, and to promote such social conditions as are incident to the sport of hunting and angling. Its rapid progress voices itself in the slogan, "One thousand members in 1919."

QUEBEC ESTABLISHES BIRD REFUGES.

Great bird colonies situated on islands in the Gulf of St. Lawrence have been set aside as game refuges by the parliament of the province of Quebec. There are three definite areas in the county of Gaspe which are included. The first, known as Perce Rock, a breeding place for herring gulls and crested cormorants, Bonaventure Island with the largest surviving colony of the gannet, and the celebrated Bird Rock, the northernmost of the Magdalen Islands. Rigorous provisions of

Fig. 64. Deer captured while swimming in Lake Tahoe. Photograph by J. Sanders.

the law prohibit the molestation of the birds' nests or eggs, the carrying of a gun or other hunting gear within a mile of the refuges. Any boat used in violation of the law is liable to confiscation and heavy penalties of fine or imprisonment are provided.

PENNSYLVANIA PUNISHES VIOLATORS.

Severe sentences are becoming the rule. In the *Fishing Gazette* we read that Clyde Wilsoncroft and Roy Reynolds of Drury's Run, Pennsylvania, were arrested by the state police for illegal fishing. Each had sixty-five trout in his possession. The men were given a hearing before Squire Griffey, of Revono, and fined $650 each, or $10 for each trout caught. Not being able to pay the fine, both men must serve 650 days in the county jail.

LIFE HISTORY NOTES.

WEIGHTS OF MULE DEER.

Extravagant statements regarding the weights of mule deer are current. Most weights given are mere estimates. It is worth while, therefore, to record the weights of two bucks taken in the Granite Mountains, Washoe County, Nevada, about September 1, 1908. Careful weights taken on steelyards showed 217 pounds and 220 pounds after the entrails and feet had been removed. A dressed forked horn weighed 180 pounds.—F. P. Cady.

DEER CAPTURED IN LAKE TAHOE.

On January 26, 1919, Henry Sall, the caretaker of the Hellman resort on Lake Tahoe, discovered a deer swimming in Lake Tahoe about three-quarters of a mile out from land, and he immediately took after it in a boat. It was in an exhausted condition, and showed marks of having been attacked by a coyote or other animals. Mr. Sall took the deer home and took special care of it, and Mr. Hellman procured a permit from the Fish and Game Commission to keep it. After keeping the deer in captivity for a week carefully chained, it was given its freedom, and since then it has never strayed away from the property even though it has absolute freedom to roam over 43 acres of ground. It has adopted the house cat, seven setter dogs and one Airedale dog. The deer appeared to be about eight months old when captured. Its mate was found later by J. E. Poman of Idlewild, near the Hellman property, partly devoured by coyotes.—Joseph H. Sanders.

OREGON CÆSARIAN FAWN A MOST HEALTHY LITTLE ONE.

At Neskowin, Tillamook County, Oregon, during the summer of 1917 deer hounds were heard back in the mountains.

Fig 4a. Cæsarean fawn successfully reared in Oregon. Photograph by Raymond Wales.

Soon they appeared on the beach, having driven out a doe. The weary doe made for the breakers and started for the rocks, then well covered with water. Later when the tide receded a search was made for the deer. She was found on the rock, but in an effort to reach safety her front

leg was broken. But, sadder yet, she was with fawn. Her life was taken and a Cesarian was quickly undertaken by the rancher. The wee twin buck had been injured and was dead, but "Fawnie" was soon ready to eat. It was miles to any hygienic nipple and bottle, so one was improvised with a cork and straw. A bed and warmness was soon provided, but in a few days the little beggar preferred the hard floor—perhaps it was more like the sunny mountain side. Soon she was weaned and drank from the cup. Days and weeks passed, and what a pet! She was ever free to return to the mountains at any time, but she liked her foster mother too well. Later she was sent to the State Hospital Farm near Salem, where she is now well cared for.—JANE FRY WALSH.

UNITED STATES FOREST SERVICE CO-OPERATION.

RANGERS CO-OPERATE WITH GAME WARDENS.

Probably in no season since the Forest Service began its active campaigns of fire protection, road building, and the surveying of summer home sites and other projects which tend toward making the summer vacations of the mountain-loving people of California more attractive and

Fig. 66. Young mountain lion captured near Hennessa, Trinity County, California. Photograph by H. W. Brannan.

beneficial, has it been so handicapped by the lack of experienced men as it was during the summer of 1918. It was the war, of course. But in spite of the fact that it was not able to put on so many men as formerly during the summer, and in many cases one man was doing the work of two in ordinary years, no lack of interest was displayed in its co-operation with the Fish and Game Commission. A sincere interest in the protection and perpetuation of the game resources of the state is evident in all the reports from the Forest Supervisors, and in many instances it is the forest rangers who come forward with constructive suggestions for the improvement of game conditions. This is due partly to the fact that all Forest Service officials know that wild life is as much a natural resource as timber, and that it should be used wisely and under the proper regulations, and partly because they wish to assist the State Commission through its local representatives who are in many localities a part almost of the Forest Service organization, good fellowship and mutual help being the rule between rangers and game wardens.

DEER IN THE NATIONAL FORESTS.

In looking over the reports we find that 2,943 deer were killed in the National Forests last season. This is an accurate record and is only what is actually known of the kill. In many cases the Forest Supervisors say that this does not represent the actual kill, which might readily be estimated at 10 or 15 per cent higher. In most localities they are holding their own and in some a decrease has been noticed. The chief factors which affect and have a direct bearing on the number are the extension of the road system under the spur of the autoist, and the increasing number of people who spend part of their vacation in the mountains. The most serious factor is the apparent increase in the coyotes and mountain lions. The campaign conducted by counties, the Biological Survey and the state has not yet (from the reports) been

intensive enough to rid the mountains of these pests to any appreciable degree. Unless it is carried on more forcefully we are liable to see a steady, if not rapid, decrease in the deer. Where sheep are grazed in the mountains during the summer months the coyotes seem to prefer them as a more easy prey than the deer, attacking the latter only in the winter. But where few sheep are grazed the reports are emphatic in the assertion that coyotes do more damage than the hunters. In parts of the Klamath Forest it is impossible to raise sheep or goats unless kept within a fence, and in other sheep raising countries the coyotes take a serious toll every year.

The mountain lion is even a more implacable foe of the deer than the coyote, and if it should become as widespread in its range and habitat it would mean the sure and early doom of the deer. Fortunately, at present, the Klamath, Trinity, Shasta, California, and Santa Barbara Forests are the only ones that report serious trouble, although the El Dorado, Stanislaus and Sierra report an increase in the numbers of lion in the last year. Here the trouble is traced to the Yosemite National Park, which has been a breeding ground for them, as no hunting or trapping is allowed except by Park Rangers or government hunters. Higher bounties and more vigorous prosecution of the work of extermination of both the lion and the more prevalent and destructive coyote are vigorously recommended.

OWENS VALLEY RESIDENTS ALL GO FISHING.

A fishing day for the Owens River Valley, when almost the entire population closes stores and homes and goes out to catch the first trout of the season, has, according to Supervisor Jordan, become an established institution.

STRANGE DEER KILLED.

Ranger Harley of the Klamath Forest reports the killing of a pure white deer and a pure black one, and adds that he has seen a third and greater wonder in the deer line, one with white head, neck, legs and belly, and cream colored sides and back.

REPORTS.

SEIZURES—FISH, GAME AND ILLEGALLY USED FISHING APPARATUS.

March 1, 1919, to June 30, 1919.

Game.

Deer meat	345 pounds
Ducks	12
Doves	8
Quail	12
Deer heads	2
Aigrettes	59

Fish.

Smelt	8 pounds
Halibut	3,630 pounds
Trout	78 pounds
Barracuda	1,501 pounds
Striped bass	1,951 pounds
Black bass	9 pounds
Catfish	175 pounds
Salmon	475 pounds
Yellow fin croaker	23,600 pounds
Crabs	1,031
Pismo clams	1,[illegible]
Abalones	383 pounds
Abalones (dried)	1,157 pounds
Lobsters	8
Dried shrimps	1,200 pounds
Set lines	5
Illegal nets	3

Searches.

Illegal fish and game	28

CALIFORNIA FRESH FISHERY PRODUCTS. COMPILED BY DEPARTMENT OF COMMERCIAL FISHERIES—APRIL, MAY, JUNE, 1919.

Species of fish	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Solano, Yolo	Sacramento, San Joaquin	Tehama, Glenn, Colusa	Contra Costa, Alameda	San Francisco, San Mateo	Santa Cruz	Monterey	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego	Total	Mexico
Albacore												375,221		277,745	652,966	17
Anchovy			146,100					4,200		76,040		240,662			470,902	
Barracuda												1,746,273	37,840	585,436	2,369,549	22,719
Blue fish									13	11,772					11,785	
Bonneeo								6,168	70	161,575					167,813	
Bonito											23	34,079	274	29,935	64,311	275
Carp		3,435		1,634	42,468		16,615	13,352							76,504	
Catfish		9,725		6,351	46,308		24,359								86,743	
Chilipepper								125,527		963					126,490	
Coalfish								2,529		716					3,245	
Cultus cod	254	8,203						220,274	6,304	8,826		1,791			245,452	
Dogfish							273	20,465		3,152	475	8,290		56,544	89,199	
Eel								70							70	
Flounder	1,050		730	1,335			269	152,188	4,785	439	725	1,479	61		160,871	
Greenfish												2,465			2,465	
Hake								37,375	6,850	716		999		2,877	48,849	
Halibut	4,948	24,772	465					8,302	854	3,726	116,566	522,859	38,419	1[illegible],799	836,691	101,485
Hard head					5,397										5,397	
Herring	150		16,670				1,470	3,710							22,000	
Kingfish								14,251	12,614	36,873	198	97,766	31	674	162,432	
Mackerel									7	10,046	2,799	761,737	2,475	18,209	801,992	2,115
Martin																
Mullet												270			270	
Perch	8,442		31,559				47	1,284	1,[illegible]	228		985		8[illegible]	43,[illegible]	1 140
Pike				8	752		140								900	
Pompano								67	371	41		2,[illegible]		[illegible]	1,[illegible]	
Rock bass											38	[illegible]	400	54,[illegible]	102,774	320
Rockfish	3,718	963						[illegible]	21,[illegible]	[illegible]	31,529	161,529	61	102,767	419,477	21,315
Salmon	17,752	409,172	12,252	315,350	90,984	148,614	408,832	6[illegible],756	487,[illegible]	2,014,[illegible]					4,[illegible],543	
Sand dab								[illegible]	[illegible]	[illegible]	583	[illegible]			[illegible]	
Sardine								4,825	91,[illegible]	2,079,729		22,087,651		4,290,642	28,[illegible],848	
Sculpin												[illegible]			[illegible]	
Sea bass (black)											365	1,786	175	[illegible]	14,[illegible]	1,[illegible]
Sea bass (white)			171						[illegible]	[illegible]	1,[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1,[illegible]
Sea trout												[illegible]		[illegible]	[illegible]	
Shad				46,179	82,720		5,717	8,[illegible]				[illegible]			[illegible]	
Shad (buck)				148,815	14,050		270,875								433,740	
Shad (roe)				175,[illegible]	16,671		736,[illegible]								930,[illegible]	

Sheepshead														454		209	646	
Shots								92,852						315			93,167	
Skipjack														9		104	113	10,665
Smelt	14,651		20,127					2,040	12,341	11,758	313	28,068	275	2,752		119,624		
Sole		15						1,167,339	174,692	25,909	11,980	18,390		222		1,398,547		
Spotfish					197											197		
Striped bass			771	92,985	53,740		102,726	40,077								290,200		
Stingaree																		
Suckers					350		43									493		
Surf fish																		
Sword fish																		
Tom cod								13,023								13,023		
Trout (bass)																		
Trout (steelhead)																		
Tuna															33,165	33,165	164,511	
Tuna (blue fin)																		
Tuna (yellow fin)												1,459,119				1,459,119		
Turbot			1,620					183				331,739				333,542		
White bait			36					2,792								2,828		
Yellowtail											191	421,693	95	381,014		802,894	4,590	
Miscellaneous					320			5,031	28	1,528	18,945	151,128	102	2,804		179,995	3,963	
Total fish	19,395	406,596	228,916	777,180	355,491	148,614	1,620,696	2,577,480	843,224	4,696,851	192,490	29,323,807	75,982	6,019,498		47,308,837	347,477	
Crustaceans—																		
Crabs (doz.)								20,996	120	8						21,124		
Berries (doz.)																		
Shrimp								256,232								256,232		
Spiny lobster																		
Molluscs—																		
Abalones	450									33,550	151,738					185,738		
Clams (pacific)			2,040									211				2,251		
Clams (mixed)	5,488		12,292					80				55				20,256		
Clams (gaper)											138,556					138,556		
Clams (soft shell)		2,565	11,623				73,337									87,525		
Cockleshell								1,320	142	860	197	3,812				6,330		
Mussels	140						1,400				2,779	2,402				6,321		
*Oyster (shell) No.			252,400													252,400		
†Oyster, lbs.			27,585													27,585		
Scallo																		
Squid									92	3,612,367		6,622				3,619,071		
Miscellaneous—																		
Frogs (doz.)								295								345		
Terrapin (doz.)	2	2						62								47		
Turtle																	2,750	

*Eastern. †Native.

VIOLATIONS OF FISH AND GAME LAWS

March 1, 1919, to June 30, 1919.

Offense	Number of arrests	Fines imposed
Game.		
Hunting without a license	7	$155 00
Deer—close season—killing or possession	22	400 00
Female deer, spike bucks, fawns—killing or possession	2	50 00
Running deer with dogs—close season	1	25 00
Illegal deer hides	1	25 00
Refusing to show license on demand	3	35 00
Selling an eagle	1	5 00
Nongame birds—killing or possession	5	55 00
Cottontail and brush rabbits—close season—killing or possession	3	75 00
Wild pheasant—close season—killing or possession	1	100 00
Tree squirrel—close season—killing or possession	1	
Goose and mudhens—close season—killing or possession	1	25 00
Ducks—close season—killing or possession	1	50 00
Golden eagle in possession	1	25 00
Doves—close season—killing or possession	3	50 00
Quail—close season—killing or possession	3	75 00
Black sea brant—close season—killing or possession	1	
Total game violations	57	$1,210 00
Fish.		
Angling without license	16	$430 00
Fishing for profit without a license	19	190 00
Refusing to show license on demand	1	25 00
Clams—undersize—close season—taking or possession	9	250 00
Crabs—undersize—close season—taking or possession	10	80 00
Using a set line	2	
Offering trout for shipment by parcel post	2	50 00
Trout—close season—excess limit—taking or possession	17	410 00
Trout—taking other than by hook and line	2	50 00
Catfish—undersize—offering for sale	3	60 00
Salt water eels—undersize—taking or possession	2	120 00
Using a fish trap	1	100 00
Dried shrimps—possession	2	
Abalones—close season—undersize—taking or possession	26	550 00
Spring lobsters—close season—undersize—taking or possession	4	80 00
Sturgeon—close season—undersize—taking or possession	2	40 00
Black bass—close season—undersize—taking or possession	1	20 00
Black bass—taking other than by hook and line	1	50 00
Striped bass—undersize—excess limit—taking or possession		
Perch—buying or selling—close season	2	30 00
Selling young fish for bait	1	20 00
Taking salmon with snag hook	1	100 00
Buying and selling salmon taken in District No. 1—close season—excess limit	3	300 00
Using a net less than ½-inch mesh for bass	1	20 00
Pollution of waters	1	
Total fish violations	132	$2,985 00
Grand total fish and game violations	189	$4,195 00

STATEMENT OF EXPENDITURES—YEAR 1919.

Items of expense	January	February	March	April	May
General administration	$1,770 04	$2,079 71	$1,993 79	$2,220 16	$2,172 26
Research, publicity and educational (game)	289 68	242 93	449 62	306 16	259 42
Printing	841 07	722 18	78 89	102 31	628 86
Fish exhibits					
Game exhibits					
Tahoe camping ground					
Mountain lion bounties	1,140 00	680 00	980 00	890 00	470 00
Lithographing hunting licenses					
Lithographing angling licenses					
Hunting license commissions	1,675 00	631 20	1,543 90	1,162 70	1,046 50
Angling license commissions	1,000 10	214 70	894 20	1,264 90	624 10
Market fishing license commissions	10 00	25 00	290 50	149 50	103 00
Hunting liens					
	$6,867 09	$4,596 72	$5,970 90	$6,127 87	$5,263 34
San Francisco district	$6,115 72	$6,099 58	$5,861 79	$6,382 82	$6,491 09
Sacramento District	3,926 85	3,822 74	4,225 44	4,293 63	4,602 95
Los Angeles District	2,504 87	2,627 60	2,379 75	2,524 90	2,39. 03
Launch patrol	1,048 47	1,112 40	1,008 73	1,059 40	6,255 47
Preventing fish and game	129 45	64 40	86 60	67 25	200 00
Crawfish inspections	200 00	200 00	300 00	100 00	58 06
Winter game feeding					
Accident and death claims	124 04	161 10	124 04	155 05	124 04
	$14,059 40	$14,090 92	$13,976 35	$14,526 05	$20,226 62
Hatchery administration	$887 20	$880 29	$977 96	$1,168 65	$1,245 86
Mount Shasta hatchery	2,097 03	1,406 00	1,704 90	2,527 12	4,425 23
Klamath station	87 82	111 60	5 00	56 00	5 00
Paul Creek hatchery	448 12	792 86	1,020 13	1,039 91	798 70
Mount Whitney hatchery	1,070 01	2,046 22	1,184 98	1,572 61	1,676 33
Cottonwood Creek station		163 75	161 65	217 67	82 84
Cottonwood Lakes station				22 12	2 35
Tahoe hatchery	5 00	5 00		5 00	5 00
Tallac hatchery	5 00	5 00	354 07	501 50	1,276 49
Chico experimental station					

Item of expense	January	February		April	May
Fort Seward hatchery	368 50	322 41	279 50	348 47	336 07
Eel River station	28 77				
Ukiah hatchery	1 50			214 90	547 72
Snow Mountain station	91 83	377 05	427 10	382 14	241 60
Brookdale hatchery	391 44	488 46	278 22	236 15	283 21
Scott Creek station	61 00	92 47	70 00	140 70	69 05
Feather River hatchery		1 20			
Almanor hatchery	12 44	367 10	154 00	172 50	195 52
Domingo Springs hatchery			202 25	191 75	248 72
Clear Creek hatchery					37 75
Bear Lake Hatchery				200 00	
North Creek station	1 03	19 75	386 86	723 17	970 54
Wawona hatchery					178 45
Yosemite hatchery			15 48	371 58	194 12
Kaweah hatchery				148 10	122 78
Fish transplanting	3 00	3 00	3 00	3 00	3 00
Screens, fishways and water pollution	456 36	545 09	649 30	712 09	809 78
Special field investigation					
Department of Commercial Fisheries	$6,517 05	$7,723 95	$7,574 40	$10,954 93	$13,782 85
	2,449 80	2,647 27	2,836 84	2,796 25	3,377 57
	$29,833 34	$28,968 86	$30,638 49	$34,405 20	$42,651 78

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